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Relief of Laryngeal Pain by Multiple Nerve Blocking.—The practice of blocking the internal branch of the superior laryngeal nerve, introduced by Hoffman in 1908, is still a popular method of relieving dysphagia but does not relieve the agonizing pain shooting from the pharynx to the ear during swallowing. Although visibly enlarged glands accompanying tuberculous disease of the larynx are uncommon, Karafiath records palpably enlarged prelaryngeal glands (gland of Poirier) in 30.5 per cent of cases. The lymphatics from the upper larynx are received by the substernomastoid glands, the largest lying in the digastric triangle, just under cover of the posterior belly of the digastric muscle. Contraction of the digastric and mylohyoid muscles on a swollen gland here would be likely to be painful as the hyoid bone is drawn upward and consummation of the act of swallowing is impeded by obstructed action of the stylohyoid muscle, this being responsible for pain in the ear, also felt. *Nervous Mechanism of Swallowing:* Six cranial nerves are concerned, as follows: (*1*) The internal branch of the superior laryngeal, supplying the laryngeal mucosa, derives from the 10th or pneumogastric (vagus) nerve. (*2*) The 11th, or spinal accessory, supplies (a) the laryngeal muscles and (b) the sternomastoid and upper third of the trapezius. (*3*) The 12th, or hypoglossal, supplies motor branches to muscles above the hyoid and assists control of the tongue. (*4*) The mylohyoid branch of the inferior dental, from the 5th, supplies the mylohyoid and anterior belly of the digastric. (*5*) The seventh, or facial, supplies the stylohyoid and posterior belly of the digastric. (*6*) The ninth, or glossopharyngeal, sends sensory fibres to the upper pharynx, and motor to the contractor muscles of the pharynx. In view of this multiplicity of innervation it is little surprise that the blocking of one branch of the tenth nerve fails to relieve dysphagia. The mylohyoid nerve is accessible at its point of division from the inferior dental nerve as it enters the mandibular foramen. The terminal branch of the facial nerve is also accessible near to its insertion from the inferior edge of the posterior belly of the digastric, by infiltrating in this region. To reach it, the neck is extended. The greater cornu of the hyoid is palpated, pushing aside the sternomastoid. Often the anterior belly can be seen descending towards the point on the hyoid where, through its median tendon, it alters its course before enlarging into the posterior belly. The internal branch of the superior laryngeal nerve is best approached with the patient sitting, chin extended. Having located the midpoint between the superior cornu of the thyroid and the greater cornu of the hyoid, an intradermic wheal is made just anterior to it. The free hand is now used to protect the carotid vessels and sheath and the needle passed into the thyrohyoid space. As it penetrates the larynx it induces slight cough and swallowing and should be withdrawn slightly before infiltrating the tissues about the nerve with 0.5 cc. of anaesthetic. By further partial withdrawal and depression

a few drops are deposited near the lower edge of the posterior belly of the digastric. The mylohyoid nerve is reached with the patient sitting, through the open mouth. The operator places the tip of his forefinger on the gum behind the last molar tooth in the lower jaw. He palpates the concave floor of a triangular space, whose apex is formed by bony ridges, the external and internal oblique lines. With a blunt probe he locates a depression over the division between the internal lateral ligament and the pterygoid muscle. The site of injection is wiped dry and the needle inserted. A mucosal anaesthetic may be used. Insertion is done as follows: (*1*) the barrel of the syringe held over the first bicuspid teeth of the opposite side until reaching the internal oblique line, (*2*) parallel with and above the molar teeth of the same side until on a level with the lingula and (*3*) over the central incisors for actual injection. If the direction is too low the inferior dental in its canal will be anaesthetized. Stott prefers procaine in 65 to 85 per cent alcohol with a little chloroform and distilled water; 2 per cent procaine formula will do and a dental carbon steel cartridge needle is used. Injections are done about once a week. *Summary: 1:* Blocking the internal branch of the superior laryngeal nerve anaesthetizes the laryngeal mucosa but does not relieve pain on swallowing. *2:* Obstructed muscular contraction causes acute pain. *3:* The lymphatics of the larynx drain into a gland which, when swollen, obstructs the action of the muscles of deglutition. *4:* The mylohyoid nerve... and muscle can be blocked by simple injection. *5:* The mylohyoid is a motor nerve but no hesitation need be felt in blocking it.—*The Relief of Laryngeal Pain, L. B. Stott, Brit. J. Tuberc., July, 1936, xxx, 155.*—(*A. P.*)

Tubular Tuberculosis of Liver.—Tuberculosis of the intrahepatic bile ducts is a rare condition and is generally spoken of as tubular tuberculosis of the liver. Three cases of tuberculosis of the bile ducts are described. The first case is that of a man dying of advanced tuberculosis of the spine, with a miliary spread into the inner organs complicated by tuberculous abscesses along the intrahepatic bile ducts. The second case was one in which, without signs of pulmonary infection, tuberculosis of the spine developed which was complicated by tuberculosis of bile ducts and of the liver. The site of the primary infection must be assumed to have been in the intestine. The third case was one of typical progressive pulmonary and extensive intestinal tuberculosis with caseation of the mesenteric, peribronchial and periportal lymph nodes, complicated by a secondary tuberculous cholangitis with abscess formation. The microscopic picture of the liver in these cases shows a rupture of caseous tubercles into the bile ducts from periportal tissue. The excretion of virulent tubercle bacilli within the bile is always due to microscopic ruptures of this kind. Development of tubular tuberculosis of the liver is favored by an early generalized spread from the primary infection, especially when the latter occurs in the intestine as the liver can be invaded from this area both by way of the lymphatics and by way of the bloodstream (portal system). This type of tuberculosis is usually found in young children and in races that do not have a high resistance against tuberculosis. Intestinal primary infection tends to spread easily and to retain virulent bacilli for a long time.—*Tubular Tuberculosis of the Liver, K. Rosenkranz & L. D. Howard, Arch. Path., December, 1936, xxii, 743.*—(*J. S. W.*)

Pleural Effusions.—The usual conception of the appearance of pleural effusions, both massive and partial, will hold true in the majority of cases if the patient is X-rayed in the upright position. In a large number of cases a change in position alters the location of the fluid. Thus, when changed from an upright to the supine position a diffuse shadow over the entire lung field is usually produced. There are some cases, however, which give a different picture from the usual even in the upright position, and these include many differences in the appearance of the upper surface of the fluid and many variations in its location. These atypical forms fall into four rather definite categories. There may be (*1*) variations in the degree of concavity. The fluid level may be flat even though there is no hydropneumothorax or (*2*) it may even be concave giving the appearance of an elevated diaphragm or a subphrenic abscess. In some cases (*3*) a mediastinal pleurisy, with only a small amount of fluid present in the periphery, may appear as an enlarged right atrium or a mediastinal tumor and (*4*) interlobar effusions, which appear to be encysted, may have fluid which is free as shown by studies in supine or lateral decubitus positions. Differentiation of atypical cases can nearly always be accomplished by making roentgenological examinations in various positions. Illustrations of each type of variation are presented. The factors involved in producing these atypical appearances are numerous. The most important include gravity, the retractile

power of the lung produced by its elasticity resulting in negative intrapleural pressures, the tendency toward cohesion between the pleurae producing capillarity, the surface tension of the fluid, and air in the pleural cavity which makes gravity the only determining factor. Attention is called to the fact that disease altering any of the above factors may give a picture simulating hydropneumothorax, and also will change the effect of a particular factor tending to produce an unusual appearance of the fluid. Transudates are more apt to be found in bizarre cases; some of these contain lipoids which are known to lower the surface tension and thus may influence the distribution of the fluid. Whenever there is any doubt as to the exact nature of a shadow, especially in the presence of fluid, roentgenograms in several positions should be made.—*Atypical Distribution of Pleural Effusions, L. G. Rigler, Radiol., May, 1936, xxvi, 543.*—(*G. F. M.*)

Diagnosis and Treatment of Renal Tuberculosis.—Renal tuberculosis is a local manifestation of a systemic infection. It is much more common in Paris than in London, corresponding to the greater prevalence of tuberculosis generally in Paris, the incidence for 1930 being 231 per 100,000, as compared with 99 per 100,000 in London. Debenham, in London, found urinary tuberculosis accounted for 5 per cent of 742 cases of haematuria at the London Hospital during 1924–1930. Fullerton, in a corresponding series of 600 cases in Belfast and vicinity, where tuberculosis is more prevalent, found it accounted for 16.6 per cent. When extraurinary lesions are present, they are most common in the lungs, but in the male genital tuberculosis is also common, about one-third of the London Hospital series, and two-thirds of those involving the epididymis. R. I. Harris, investigating 100 cases of bone and joint tuberculosis, found 37 per cent of the adults and 14 per cent of the children had tubercle bacilli in the urine. Band's findings with animal inoculation were 14.4 per cent positive. Thomas and Kinsella found about 11 per cent asymptomatic. Frequent micturition is usually the first and sometimes the only symptom. When it persists there is usually pain. These symptoms may be intermittent. Haematuria is sometimes the first symptom and should always arouse suspicion, especially in young subjects, especially if there is tuberculosis elsewhere. Pus is nearly always present in the urine and if the urine is sterile is strongly suggestive of renal tuberculosis. Tubercle bacilli are usually associated with it and may be found without it. Cases of chronic pyelitis and cystitis, especially of gradual onset, which do not improve under routine treatment, or become worse, should be subjected to full urological examination to exclude tuberculosis. The incidence of mixed infection is variously estimated at 11.4 per cent (Constantinesco and Vintici) and 55.9 per cent (Kretschmer, in adolescents). The onset of renal tuberculosis may be associated with prolonged malaise, anaemia, loss of weight and elevation of temperature. Cystoscopy may be negative or merely show diminished bladder capacity, or miliary tubercles, mild cystitis or ulceration. The ureteral orifice on the affected side may be oedematous, or show adjacent tubercles or ulceration. Ureteral catheterization separates the urine from each kidney, revealing presence or absence of pus or excessive leucocytes. Intravenous pyelography is often of value but may be negative in the presence of small lesions. Later, films will show dilatation of pelvis and calyces, and irregular or round stumpy outlines, perhaps obliteration of a calyx, or even a cavity. Retrograde pyelograms give better definition and the risks are small if overdistension is avoided. The early diagnosis of renal tuberculosis requires not only careful and scientific craftsmanship but full appreciation of the fact that renal tuberculosis is haematogenous in origin and only one manifestation of a systemic infection, that its onset is insidious and may be asymptomatic, and that systematic urine examinations should be done in the case of every tuberculous subject. The presence of tubercle bacilli in the separated urine always means that a kidney lesion exists. Medlar has shown that small lesions may heal with scarring. Transient tuberculous bacilluria should lead to further observation as few of such cases show permanent complete healing, with disappearance of abnormal urine. Only in the initial stages is general treatment alone successful and in these the lesion is so small that pyelography does not reveal it. More advanced cases may show periodical remissions, even for years. It is possible that ureteral obstruction or occlusion may shut off the source of bladder infection but the term "autonephrectomy" is not a happy one. Such a kidney should be regarded as a menace and be removed if the other is healthy. It may give rise to miliary tuberculosis or perinephritic abscess, or communication with the bladder may later be reëstablished. Schaffhauser recently states that there are only two undoubtedly cured cases reported with adequate microscopical and bacteriological controls, one by

Wildbolz and one by Castaigne. To these, one, with biopsy, is added by Lett. The question of nephrectomy will depend on the existence of active disease in the lungs and other kidney. Thomas has well said that surgery will not benefit the patient until he has developed his resistance adequately. The change following sanatorium treatment of a seaside vacation or even prolonged bed-rest is often remarkable. Operation should never follow immediately upon diagnosis. The results are unsatisfactory, miliary tuberculosis, breaking down of the wound and sinus formation frequently supervening, as well as disease in the other kidney. It should be emphasized that nephrectomy for renal tuberculosis is not an operation of emergency and that those cases showing acute symptoms should always undergo preliminary general treatment, preferably at a sanatorium. Gentle handling of the kidney is important to prevent the escape of pus or tuberculous material into either the blood-stream or surrounding tissues. Opinions differ on the question of removing perinephritic fat and the length of ureter which should be excised. In view of the lymphatic connections between the perinephritic fat and the kidney its removal in early and uncomplicated cases is deemed best by Lett, but care must be taken to preserve the adrenal. The pathological changes in the ureter vary greatly. While the stump of the ureter may remain innocuous, the tuberculous process in another case may continue to extend through its wall and cause abscesses in the pelvis or iliac fossa or even the lumbar region; or, infection of the ureteral stump may keep up the cystitis, and this may lead to involvement of the opposite ureter and kidney. Stricture and hydronephrosis are other possibilities. Therefore every effort should be made to control the bladder infection and recovery may vary from a few weeks to as many years. Persistence is usually due to persistence of an infective focus and Lett records three cases where he regrets he did not completely resect the ureter. He does not think it logical to leave several inches of tuberculous ureter in direct communication with the bladder. Opinions are also divided as to whether the operation should begin with the separation of the kidney and division of its vascular pedicle, or with division of the ureter. The former procedure is perhaps more general. If this is done, two incisions are recommended, the last subumbilical, and paramedian, through which the ureter is freed and it and the kidney brought out. If division of the ureter is to be done first, Lett prefers a low inguinal incision, splitting the muscles as suggested by Kidd, with subsequent removal through the usual posterolateral or lumbar incision. The ureter is severed by diathermy after ligating and its ends cauterized with phenol. For aftercare, the great value of prolonged sanatorium treatment is emphasized. In general, nephrectomy for renal tuberculosis results in a cure in from 55 to 60 per cent of cases.—*Renal Tuberculosis: Early Diagnosis and Treatment, H. Lett, Lancet, December 5, 1936, ccxxxi, 1313.*—*(A. P.)*

Tuberculosis of Urethra.—This condition is apparently rare, Panel, cited by Chute, recording 7 cases, or 1.75 per cent, among 380 with urogenital tuberculous lesions from a total of 1,455 necropsies. However, Pelouze believes it more common; especially among patients with a chronic urethral discharge. The condition is distinct from tuberculosis of the glans penis, regarded as a primary infection from coitus or circumcision. Tuberculosis of the urethra is secondary to some other genital lesion and ulceration, when present on the glans, is always at the meatus. The infection is a descending one, with the bulbous urethra more often involved than the anterior. Abundant purulent discharge occurs when the urethral mucosa and submucosa have been invaded. Tubercle bacilli are rarely found in this but in the centrifuged urine. Palpation of the urethra through the penis reveals typical "beaded" areas. Tuberculosis of the epididymis or seminal vesicles is the commonest source of infection and in the later stages generalized or miliary pulmonary tuberculosis is not uncommon. By this time constitutional symptoms will be present. Instrumentation in diagnosis is to be avoided as the trauma may result in extensive dissemination both direct and indirect. *Case Report:* A white male machinist was admitted to the Springfield Hospital with purulent discharge from the penis, associated with pain and burning on urination. There was a history of trauma to the scrotum in 1931 and recurrent pain in 1932 and 1933. In 1934 a traumatic hydrocele was diagnosed. The right testis was removed elsewhere and found tuberculous. Following this there occurred frequent burning urination. Three months prior to this admission (1935), following local instrumentation, the urethral discharge appeared. He had lost twenty pounds weight in four months, cough for one month, and night sweats for two weeks. Physical examination showed, in addition to local findings, evidence of pulmonary tuberculosis, quite extensive by X-ray, and acid-fast bacilli were found in the centrifuged

urine after repeated examinations, with also many pus and a few red blood cells. The patient lived only a little over a month, dying with meningeal symptoms after transfer to the Springfield Isolation Hospital.—*Tuberculosis of the Urethra, with Report of a Case, I. N. Kilburn, New England J. Med., July 16, 1936, ccxv, 112.—(A. P.)*

Treatment and After-Care.—The need of after-care depends on the degree of recovery, that is, working capacity, reached on discharge, and on domestic and economic conditions to which the patient will return. The marked improvement in the results of treatment of tuberculosis in the last five or six years is of fundamental significance. The most reliable objective criterion of results of treatment is probably the results of regular sputum examinations. Also, the mortality and working capacity of the survivors six years after discharge can be considered a fairly reliable criterion of late results. Bronkhorst cites figures from his own statistics at Sanatorium Berg and Bosch, Bilthoven, Holland, and also from Münchbach. Patients are divided into three principal groups according to the sputum: (*1*) positive on admission and discharge, (*2*) positive on admission, negative on discharge, and (*3*) negative on admission and discharge. The term "negative" means regularly negative for several months. Only cases with definite active tuberculosis are included. The figures show a marked difference in survival according to whether or not the sputum became negative on discharge, but not so much difference between the positive-negative and negative-negative group. Bronkhorst's figures for the last few years show that an average of 84 per cent of patients with open tuberculosis became negative on discharge, the most marked increase being since 1928. He attributes the improved results partly to a longer duration of the cure, partly to improved methods of rest treatment and partly to a more extensive application of collapse therapy and improved indications for this. The figures from Münchbach show less improvement since 1928. Ulrici's figures are also cited with regard to cases of open tuberculosis treated by lung collapse (pneumothorax, phrenicectomy and thoracoplasty). Of these, 40 per cent became sputum negative (1929–1934) as compared with 70 per cent (1931–1934) at Bilthoven. Bachmann found the figure in Swiss sanatoria in 1930 averaged 55 per cent. Bronkhorst requires that repeated examinations of the sputum shall have been negative for at least six months before discharge and for the majority of patients with open tuberculosis some form of collapse therapy has been used, especially during the last five years. At Bilthoven a prolonged intensive rest treatment in bed is the rule. Next to collapse therapy this is most indispensable. The application of vocational therapy is the necessary finishing touch needed to assure results. After-care is the necessary consequence of deficiencies in treatment. Social and economic conditions play an important part in both, as better living conditions must be prepared for the patient. After-care colonies are best organized in conjunction with sanatoria. The better the results of clinical treatment, the fewer will be those patients in need of prolonged sheltered employment. The first condition for good results is therefore advanced clinical and anatomical healing judged by all important criteria. This condition is not fulfilled while the patient has positive sputum. The stay in the after-care colony should continue until the disease is sufficiently arrested. A permanent arrest for two years is good insurance against relapse. Most patients with positive sputum after prolonged careful clinical treatment are unlikely to obtain arrest of their disease even under most favorable conditions and few have any real working capacity. A few still able to perform certain duties are maintained in a state of very unstable equilibrium. Varrier-Jones was among the first to point out the necessity of proper organization of industries in employing patients. For these industries to function well, it may be well to select key men from among expatients with relatively good and stable working capacity. These groups will grow in numbers as the industries extend. Experience has taught us that there are limitations to the possibilities of early diagnosis and that, even with good dispensary organizations, the sanatoria are still full of cases of open tuberculosis. The addition of occupational therapy and after-care to the sanatorium facilities gives us hope of more complete fulfillment of the possibilities of modern tuberculosis institutions.—*Clinical Treatment and After Care, W. Bronkhorst, Tubercle, October, 1936, xviii, 1.—(A. P.)*

Adrenalin in Haemoptysis.—Sixteen cases of haemoptysis were treated with intratracheal insufflations of 1 cc. of 1:1000 adrenalin solution dissolved in from 3 to 5 cc. of water. No previous anaesthesia was given, but 1 cc. of heroin or morphine was injected subcutaneously in the more severe haemorrhages. In five cases (one of them severe) one intratracheal injection

was sufficient to stop the haemorrhage. In three more, two injections (one every 8 hours) were necessary to stop the haemorrhage in from one to two days. In three other cases (one severe and two moderate) eight injections were necessary in four days, and the therapeutic action was doubtful, since the haemorrhage subsided gradually. In five more (three of them severe) ten injections were given in five days. One of these severe cases died from the haemorrhage; in the second one it was necessary to recur to artificial pneumothorax, and in the third one the haemorrhage lasted five days. Subcutaneous injections of oxygen were tried in seven cases of severe haemoptysis with prompt cessation of haemorrhage in one, gradual improvement in three and complete failure in three more.—*Nuestra impresión sobre la nueva terapéutica de las hemoptisis, F. S. Gómez & J. L. Vilar del Valle, Rev. de Tuberc. d. Uruguay, 1936, v, 259.*—*(J. R. P.)*

Fever Therapy in Pulmonary Tuberculosis.—At the University Dermatological Clinic of Berne 178 cases were given fever therapy, of which 122 were treated with gonovaccine or "Pyrifer" and 53 with mechanical methods. There were 150 cases of gonorrhoea and 28 cases of syphilis; 15 cases showed evidence of an old arrested tuberculosis and in 27 cases there was tuberculosis in the family. The remaining 136 cases failed to present any trace of tuberculosis. In no case was the reaction to the fever therapy indicative of a tuberculous flare-up. These somewhat startling observations seem to be in contradiction to the observations of other authors as well as to the present general opinion as to the possible danger for tuberculous patients from nonspecific protein therapy. Therefore the author feels that by inducing high temperatures for a certain period of time an agent may be brought in which protects the patient against either an activation of a hitherto silent lesion or against reactivation of a low-grade infection. The author is well aware of the fact that his conclusions are contrary to the present theoretical concepts and to the results of the observations of several leaders in this field.—*Bedeutet Tuberkulose als Nebenbefund eine absolute Kontraindikation für Fiebertherapie?, C. Legobbe, Schweiz. Med. Wchnschr., April 17, 1937, lxvii, 355.*—*(F. G. K.)*

Oxygen Tent.—Most of these observations were carried out on a Poulton tent assembled by the Rolls Razor Company and lent to Saint Bartholomew's Hospital, London, by the British Red Cross Society. Clinically the results were better than with any previous method of oxygen administration and patients could be readily kept continuously in the tent for up to ten days. The criticisms refer to practical details. Until every house officer knows how to run it, new persons have to learn the details each time it is in use, and nurses and ward clerks have to be instructed. It was found that the tent could be set up and necessary instruction given in two hours. Once running, it can be managed by ward clerks and nurses. It is very little hindrance to general nursing, as the sleeves can be used for temperature taking, medicines, feeding, etc. while the tent need only be untucked for bedpans, washing, and examination of the patient. An extra night nurse is essential to manage both tent and patient. The ordinary 20 cubic foot oxygen cylinders are too small and even 60 cubic foot cylinders last but six or eight hours. It is advisable to use 100 cubic foot cylinders with a special stand for transportation. Protosorb soda lime is used, green when fresh and brown when exhausted. The larger containers last twelve to fifteen hours. The patient's reaction is vitally important. Rarely is there real intolerance. The material should be more substantial and the seams and joints better made. Suitable temperature and humidity are difficult to maintain because the temperature falls rapidly with humidity at normal levels and additional heat is advisable. To obviate the noise of the falling of melting ice in the radiator the latter may be kept half full of water. The flowmeter is simple and can be checked on a water flowmeter. The soda lime containers are too weak and easily bent. It is suggested that a filter should be fitted to the upper outlet and the lower inlet be prolonged along the bottom of the tin as a perforated pipe, over which lies a perforated plate. Thus the soda lime would be used up evenly from below upwards. The oxygen concentration should be estimated hourly because in any case requiring much nursing it varies considerably. The oxygen pipette used for this purpose could be improved on. The only feasible means of supplying oxygen to a patient are (*1*) by means of the nasal catheter, (*2*) by a box mask, and (*3*) by a tent. The nasal catheter method is too limited, even with the Woulfe's bottle humidifier. Two short catheters are best, kept in place by the method of Marriott and Robson. By this means a flow of 4 to 5 litres per minute is tolerated, bringing the alveolar oxygen up 33 per cent, compared with 50 to 60 per cent with the tent. The peripheral stimulation is also of value.—

A Note on the Oxygen Tent, D. C. Reavell, Lancet, August 1, 1936, ccxxxi, 250.—(A. P.)

Box Mask for Oxygen Administration.—This mask was primarily introduced to reduce the wastage with other open methods while at the same time preserving the patient's comfort. With the method described, as the mask is freely open at its lower end there is no resistance to breathing such as occurs when valves are used and the material is light, either card board or aluminum. The patient is not isolated from surroundings over a prolonged period, as when a tent is used, and yet an efficient oxygen pressure is maintained. The mask is manufactured by an English firm which uses aluminum. As used for the average adult the gas capacity is about 1,000 cc., its dimensions 15 x 12 x 7 cm. The long axis of the box lies in the long axis of the face, with the plane of breadth parallel to the mouth and that of the depth nearly at right angles to the face. A bottle-shaped opening at the back accommodates the nose, mouth and chin. It is held in position by tapes buckled on the sides and passing over the top of the ears. The top, which is kept closed, has an opening to admit a catheter, made air tight by adhesive plaster. The sides are closed and the front is air tight with a door in the lower half which may be opened for meals or medication. Moisture from the lungs, condensing on the inner surfaces, is caught by a thin strip of lint fixed around the lower edge or by small pieces of plaster. Small openings cut 1 cm. deep parallel with and above the lower ends of the sides and door serve as emergency vents. The oxygen cylinder has the standard automatic regulator and a bobbin flowmeter to measure the rate, also a water valve to moisten and, if necessary, warm the gas. For this purpose a basin of warm water suffices. A light rubber tube leads from the water bottle to the catheter and must be attached to the head of the bed above the patient to allow sufficient slack tubing for movement. The catheter itself is fixed to the opening at the top of the mask and its end lies either three inches within the nasal cavity or free outside and above the level of the nose. Three holes are made in the nasal end and nos. 9 and 11 red rubber are used. If the catheter is outside the nose its tip must be directed upward. For efficient working the upper half of the mask must be air tight. A mixture of air and oxygen enters with each inspiration. Figures are given for alveolar carbon dioxide and oxygen with the box mask and, according to rate of flow, have shown alveolar oxygen pressures from 40 to 70 per cent with the catheter intranasally; with it outside, 40 to 60 per cent. Alveolar air was taken with the oxygen flow stopped. It was also shown that, even with the catheter outside the nose, this mask consumes only half the amount of oxygen used by other methods. While tents can be run on 2 to 3 litres per minute compared with 4 to 7, they necessitate much more attention and equipment, including soda lime and a cooking mechanism, and isolation of the patient. With the box mask, there is no undue accumulation of carbon dioxide and the gentle flow of oxygen down the sides has a pleasant cooling effect. Observations now being made on children indicate its suitability at least for older ones. In practice no gas analysis is necessary, the flowmeter control being sufficient, 5 to 6 litres per minute. No naked flames or smoking are allowed nearby.—*A Box Mask for Administration of Oxygen, J. A. Campbell, Brit. M. J., June 20, 1936, no. 3937, 1245.—(A. P.)*

Rationalizing Pneumothorax Treatment.—The reputation of artificial pneumothorax treatment of pulmonary tuberculosis is based on striking successes in a minority of cases. In the majority, not grossly dissimilar, either its success is only partial or temporary or it completely fails. The reason is that the treatment is not a specific and selection of cases should be based on an estimate of the kind of help required. We ought not to apply the method indiscriminately but to try to discover just what help the patient needs and to use pneumothorax when there is a reasonable prospect that it will give that help. Otherwise, the results will be uncertain and discredit may fall on a valuable remedy. When a lung is distended it is under tension and therefore contractile. One important point to be attained by an artificial pneumothorax is abolition or material reduction of tension in diseased areas. Collapse of a lung may also be assumed to produce a retardation of blood and lymph flow, although this is not conclusively proved experimentally. As a tuberculous pulmonary lesion probably progresses mainly by means of the air passages and plugs of infected mucus in diseased lungs tend to be drawn peripherally during the inspiration preceding cough, this vicious inspiratory progression may be checked by collapse and aspiration infection halted. (Ameuille's experiments with lipiodol are cited.) Again, the state of pulmonary cavities is determined by the operation of three factors—necrosis, inflation and fibrosis. Inflation and fibrosis are counteracting forces. Collapse may primarily affect recent cavities by reducing tension

resulting in inflation and may secondarily affect chronic cavities by promoting fibrotic contraction. Urgent haemorrhage may be controlled either by reducing blood flow or by aiding formation of blood clot in the bleeding space. *Accomplishment of Desired Effects:* These may be (*1*) relaxation of lung, (*2*) reduction of toxaemia, (*3*) checking of spread, (*4*) closure of cavities, and (*5*) cessation of haemorrhage. If collapse accomplishes these things the prospects are good; if not, treatment by this method is useless or harmful. Healing depends mainly on two factors: (*1*) the possession of resistance, shown by the "fibrosing faculty," and (*2*) the suppression of unfavorable mechanical conditions. 1. *Relaxation:* When relaxation is the desired effect, reduction in size of the affected area is essential. This can be visualized roentgenographically. By selective collapse is meant a collapse more or less confined to the diseased area. It must also be accompanied by some clinical improvement, although the two may not coincide. If adhesions interfere with selective collapse, at least a progressive decrease in opacity of the affected area must be visualized; it should be noted within a few weeks and be progressive. In the average successful case selective collapse should be well marked after three weeks or pathological opacity disappear within six months. 2. *Reduction of toxaemia:* Here the degree of collapse effected is less important than the effect on the temperature. The more quickly the latter falls the better the prognosis, but in any case it should return to normal within two weeks and toxaemic symptoms must decidedly decrease. Satisfactory reduction of toxaemia is accompanied by evidence of healing of tuberculous lesions elsewhere, for example, in the other lung or the larynx. 3. *Checking of spread:* The desired effect is being obtained if there is no roentgenographic evidence of extension and pulmonary and toxaemic symptoms improve. 4. *Closure of cavities:* Recent necrotic cavities should show a decrease in the first two weeks if there is good collapse of the affected area. Recent round cavities shrink concentrically. In both types complete disappearance should occur in two to six months. If, as occasionally, round cavities become more obvious, or perhaps larger, treatment should be continued three months if the patient's condition improves, but not longer unless pneumonolysis is contemplated. Necrotic cavities with a fibrotic wall rarely close completely and are not usually favorably affected. 5. *Cessation of haemorrhage:* When instituted to control urgent haemoptysis, the effects of collapse should be immediate and no more fresh blood be coughed up. Recurrence of bleeding renders the prospects of success meagre, providing collapse is sufficient. *Progress and Duration of Treatment:* The period during which the desired effect is produced is the "period of initial response." This is followed by the "period of healing" and completed by the "safety margin." If the initial response is rapid, the period of healing is correspondingly shortened, and *vice versa*. Results of sanatorium treatment show that relapses occur particularly within the first two years, which suggests that this period of sanatorium treatment and subsequent regulation of life is required to effect durable healing. It may be assumed that healing occurs more rapidly under a satisfactory pneumothorax and the following guides are suggested for uncomplicated cases: (*1*) Where relaxation was the desired effect but selective collapse not obtained, the period of healing is six months plus the time taken for disappearance of the original opacity. Another six months is added for safety margin and also the period required to obtain the desired effect. (*2*) Where reduction of toxaemia was the desired effect, six weeks of healing for each week of pyrexia is suggested (that is, pyrexia following induction) plus a safety period of six to twelve months. (*3*) Where closure of cavities is the desired effect, at least one year should be allowed since the cavity ceased to be visible by X-ray. The time should be longer if the cavity was large, not recent, or had a fibrous wall. (*4*) Where checking of spread was the aim, the period is the longest required under (1), (2) or (3). (*5*) Pneumothorax to check haemoptysis should either be continued for the disease as if there had been no haemoptysis, or allowed to absorb at once, in which case the chances of being able to repeat it are better. Collapse for recurrent haemoptyses should probably be maintained for six months or a year beyond the time of expected recurrence. A period of six months is suggested for the safety margin. The argument that relapse may occur on re-expansion is a confession of failure to understand the essentials. Reactivation is more often due to fresh disease in the other lung, probably dependent on faulty resisting power. Continuity of treatment is desirable but not always obtainable. *Assessment of Needs:* The patient requiring lung relaxation (not necessarily immobilization) is one possessing fair resistance but not sufficient for satisfactory healing. The disease has usually been slowly progressive. Pulmonary symptoms are more pronounced than toxaemic. The patient requiring reduction of toxaemia usually gives a shorter

history, with more constitutional impairment. Collapse therapy is more promising than mere bed-rest but often fails. Cases requiring checking of spread usually have X-ray evidence in excess of the symptomatic. Thin walled annular cavities are most readily collapsed. While a minority will disappear with prolonged complete bed-rest, most will not, and delay may render later collapse ineffective. The "right upper lobitis" type is particularly suitable for collapse at once as adhesions form early, and response to pneumothorax is much better than to conservative measures. Fowler estimates that a normal 90 per cent mortality in three years is reduced to 33 per cent. Middle and lower zone cavities are still more in need of collapse. In chronic fibrous cavities, however, pneumothorax may do more harm than good; especially those of apical location.—*Rational Pneumothorax Treatment, G. T. Hebert, Brit. M. J., August 8, 1936, no. 3944, 272.*—(*A. P.*)

Vascular Factors in Contralateral Pneumothorax.—The frequently observed favorable effects of pneumothorax upon contralateral tuberculous lesions are not readily explainable by the accepted mechanical concepts of the action of pneumothorax. Certain workers who have made studies with pulmonary arteriography state that the circulation in the collapsed lung appeared to be considerably diminished and slowed. Thoracic surgeons have stated that there is a circulatory stasis in the collapsed lung. Steimbach and Lindblom vouch for a definite compression of the walls of the veins, thus accounting for the hyperaemia in the collapsed lung. It has also been shown that there is a diminution of the amount of blood circulating in the lung proportional to the degree of collapse. The pulmonary circulation is much influenced by the elastic tension of the lung parenchyma. After initiation of pneumothorax the tension of the contralateral lung is decreased in proportion as the mediastinum in any given case transmits the tension of the homolateral side. Thus the differences in circulation noted between the two sides are only relative and always less than that of a healthy uncollapsed lung. A case in which following the institution of pneumothorax a favorable result occurred in a contralateral cavity is discussed. Apparently an area of congestion appeared about the cavity simultaneously with the latter's almost complete disappearance. As the mediastinum gradually ceased to transmit the decreased negative pressure maintained on the homolateral side the cavity reappeared, but greatly diminished in size. At the same time the congestion of the surrounding tissue disappeared. A few months later the cavity was completely healed.—*La part vasculaire dans le mécanisme d'action du pneumothorax contralatéral, M. Fourestier, Arch. Med. Chir. l' App. Resp., 1936, xi, 377.*—(*C. L. D.*)

Artificial Hydropneumothorax.—Artificial hydropneumothorax is indicated in pulmonary tuberculosis with laryngeal or intestinal complications, but its chief indication is extension of the lesion to the contralateral lung. Three cc. of yellow codliver oil, sterilized in autoclave, are injected in the pleural cavity of the side where pneumothorax is being given. Greater quantities are unnecessary and painful. The frequency of the injections depends on the amount of liquid produced. At times the fluid reaches the level of the angle of the scapula with the first injection. When the fluid tends to disappear, 2 or 3 cc. more of oil are injected. Pneumothorax is maintained. The inconveniences are the pain of the first injection and the fever. The pain is comparable to the pain of a first pneumothorax and the fever reaches 39°C. or more and lasts from two to five days; but after this, the temperature becomes lower, cough and expectoration disappear, the appetite improves and the lesions of the contralateral lung heal by cicatrization or disappear altogether. In the cases observed, the fluid has always been clear. The pleurisy has vaccinating properties and leads to retraction, pleural symphysis and interstitial fibrosis. The results are superior to those of simultaneous bilateral pneumothorax. The chief indication is severe (but not massive) lesions in the contralateral lung.—*Hidroneumotórax artificial, J. R. B. Vitorero, Rev. Asoc. Med. Argent., March, 1936, xlix, 336.*—(*J. R. P.*)

Bilateral Pneumothorax and Pregnancy in Pulmonary Tuberculosis.—The preponderance of opinion is undoubtedly against permitting pregnancy in pulmonary tuberculosis because of the liability to extension of the disease, not only during pregnancy but during parturition and afterwards. Artificial pneumothorax has brought about some change by offering the possibility of improvement in the tuberculosis during pregnancy, as first described (1913) by Kuthy and Lobmayer. Schill here reports on two cases, the first in some detail, with extensive bilateral cavitary lesions, treated by pneumothorax during pregnancy, with satisfactory results, at least temporarily. The patient whose case is fully reported announced her pregnancy

about the third month and the more diseased lung was then put under collapse, the other being treated about five months later. Observations were hindered during confinement, which resulted in a stillbirth and the pneumothorax had disappeared when she returned but was reëstablished on the original side, the other lung appearing healed. A year later the pneumothorax was lost but the patient was in satisfactory condition, doing heavy work. Such a result, while not uniformly obtainable, is worth striving for. Schill cites six previously recorded case reports of bilateral pneumothorax in pregnancy, all favorable—Ronzini, Rist and Coulaud, Triboulet and Valtis, Roloff, Frischbier and Sokolowskaya. He emphasizes the importance of accommodating the refills to the changes in volume and pressure in the chest accompanying and following gestation, and especially of resuming refills immediately after birth. Mediastinal displacement should be avoided. The side showing most rapid resorption is first refilled empirically and then the other with a smaller amount. If pulse and respiration are greatly increased, digitalis is advised. If a pregnant tuberculous woman is seen early there is time for individual consideration of the advisability of terminating the pregnancy but after three months a premature birth or abortion entails as much risk as a full-term one.—*Bilateral Pneumothorax and Pregnancy, E. Schill, Tubercle, September, 1936, xvii, 551.*—(*A. P.*)

Medicopneumothorax.—Hitherto in artificial pneumothorax only pure atmospheric air, or one of its constituent gases, has been used. The purpose has been to mechanically immobilize the diseased lung and it never seems to have been suggested that the gas should also act pharmacologically. However, Müller conceived this idea and the Berlin firm of Inhabad Gesellschaft has made an apparatus as easily managed as the ordinary pneumothorax outfit. The device, called the "electro-inhalator," transforms a mixture of aromatic and antiseptic drugs, containing gomenol as one chief ingredient, into vapor, which is then conducted to the air container and induction of pneumothorax is performed in the usual way. There is thus introduced into the pleural cavity air saturated with these strongly antiseptic substances, which exert a direct sterilizing effect, not only by surrounding the lung with a disinfectant medium but by gaining access to the interior of the organ through regular respiratory gas exchange. The patient's breath soon after induction acquires the odor of the vapor. An important advantage is the entire avoidance of pleural exudates, which ordinarily occur in 80 per cent of cases. Also, detoxication, fall of temperature, and disappearance of tubercle bacilli from the sputum occur sooner than by the ordinary method. It is reasonable to assume that healing is thereby accelerated and that "medicothorax" deserves a place in the modern treatment of phthisis.—*Medicothorax, A New Form of Artificial Pneumothorax, V. Müller, Lancet, September 12, 1936, ccxxxi, 625.*—(*A. P.*)

Intrapleural Pressure in Artificial Pneumothorax.—Respiration may be considered as having three phases. These are inspiration, expiration, and the respiratory pause which follows expiration. This last phase is the one in which there is true dynamic rest of the lung. Thus, in order to insure the greatest amount of rest, minimum tension should be achieved at the time of the respiratory pause. This pause occupies nearly one-half of the respiratory cycle. Consequently in therapeutic pneumothorax maximum rest is secured for the affected part only if the pressure is maintained at such a degree that it is equal to zero at the time of the respiratory pause. If a zero pressure is established at any other time in the cycle it is impossible to make the moment of minimal tension coincide with dynamic rest and the lung will therefore never achieve the maximal reduction in tension.—*La pression intrapleurale dans la conduite du pneumothorax, A. Sztejnberg, Arch. Méd. Chir. l'App. Resp., 1936, xi, 465.*—(*C. L. D.*)

Artificial Pneumothorax Treatment.—Artificial pneumothorax treatment in pulmonary tuberculosis requires careful roentgenological studies. Therefore, the roentgenologist should have a thorough knowledge of the various phases of the treatment. The basic principle of artificial pneumothorax is rest of the affected lung. Mechanically, there are two important results; the normal tendency of elastic and connective tissues to contract is permitted and, if the collapse is sufficient, cavities may be closed. Physiologically, it produces a relative passive hyperaemia with a relative ischaemia and slowing of lymphatic drainage of toxins and a tendency for connective tissue to proliferate. The type of gas used is of little importance. The collapse occurs chiefly at the apex and affects the outer two-thirds of the lung more than the inner one-third. Indications for collapse with artificial pneumothorax include a positive sputum, spreading unilateral disease with a

positive sputum, cavitation, haemoptysis, and pleural effusions. The opinions of operators vary regarding the degree of collapse needed, some favoring a small amount and others favoring a fairly complete collapse with slightly negative intrapleural pressures. The latter method tends to prevent the formation of adhesions or the development of an obliterating pleuritis. The complications met with are recognized only by use of roentgenograms or fluoroscopy. The ones most frequently encountered are adhesions preventing a satisfactory collapse, pleural effusions, mediastinal herniation, mediastinal shift, and spread to the contralateral lung. The roentgenologist can give valuable advice on the size and position of adhesions and the probable outcome of an internal pneumonolysis. All patients develop fluid to some extent at one time or another. About 20 per cent develop an appreciable amount. This should be aspirated and the fluid replaced with air to prevent an obliterating pleuritis. Frequent X-ray films should be made to detect any spread of the disease to the contralateral lung. When indicated, bilateral pneumothorax may be instituted. Sometimes it is necessary to discontinue the first pneumothorax before starting the second. All bilateral cases should be examined with fluoroscopy once a week. The collapse should be maintained for a minimum period of three years. Many favor continuing such collapse five to six years. During the first six months the patient's activity should be restricted. Part-time work may be permitted during the second year and usually full-time work may be undertaken after that. Reëxpansion of the lung should be done slowly and carefully under close observation. A phrenic neurectomy may be done at this time to decrease the space which the re-expanded lung must fill and lessen the danger of reopening a fibrosed lesion.—*Pneumothorax Treatment of Tuberculosis, R. K. Childerhose, Radiol., December, 1936, xxvii, 741.—(G. F. M.)*

Therapeutic Pneumothorax and Bacillaemia.—Thirteen patients with active pulmonary tuberculosis, having tubercle bacilli in the sputum and running high fever, were tested for the presence of tubercle bacilli in the blood-stream after receiving therapeutic pneumothorax. Specimens of blood were taken before collapse and thirty minutes, twenty-four hours and three days following inflation. Each specimen of blood was cultured on five tubes of Loewenstein's egg medium and inoculated into three guinea pigs, making a total of 260 culture tubes and 156 guinea pigs. Forty-four of the animals died before the tenth day. Their organs were all cultured for the presence of tubercle bacilli. The remaining animals were sacrificed four to six months later. Their organs were also cultured, inoculated into guinea pigs and examined histologically for tubercle bacilli. At no time did any of the animals show a positive reaction to tuberculin. Not a single animal showed the presence of tubercle bacilli by cultural or histological examination or by animal inoculation. None of the cultures from the blood of the patients yielded tubercle bacilli. This is in agreement with the work of other experimenters that the creation of pneumothorax does not favor a haematogenous discharge of tubercle bacilli into the body.—*Existe-t-il une liason entre la création du pneumothorax thérapeutique et la bacillémie tuberculeuse?, I. Tuchila, Compt. Rend. Soc. Biol., February 20, 1937, cxxiv, 602.—(M. T. W.)*

Simultaneous Bilateral Pneumothorax.—Artificial pneumothorax therapy is unquestionably the greatest advance in treatment during the last twenty years and it is unfortunate that its applicability is limited. However, simultaneous bilateral collapse, by extending its scope, presents a further field not generally appreciated in England as much as in America and on the Continent. In this report, 44 consecutive sanatorium patients treated during the last seven years are considered, divided into two groups, as follows: (*1*) Cases considered primarily for simultaneous bilateral pneumothorax. In these the interval between the induction on each side of pneumothorax was short, usually two to four weeks. The lesions might be active or spreading lesions in both lungs, a spreading lesion in one lung with a symptom-producing lesion in the other, or non-spreading but symptom-producing lesions in both lungs. (*2*) Cases with originally unilateral pneumothorax with subsequent relapse or progression in the contralateral lung, later treated by pneumothorax. Here the interval varies greatly. In the first group the more heavily involved lung is first collapsed, but the amounts of air introduced are smaller than in unilateral cases, for example 150 to 200 cc. Efforts are made, checked by fluoroscopy, to obtain a satisfactory selective collapse of the diseased area. When this point is reached attention is directed to the other lung along the same lines. The degree of collapse need not be the same on both sides and skilful attention is needed to maintain the optimum balance. The most favorable results are undoubtedly obtained in cases

with lesions confined to the upper lobes, where selective apical collapse is feasible and the lower lobes allowed to inflate freely. In the second group, more conservative methods, such as prolonged bed-rest and chrysotherapy, may be tried first, the state of the new lesion being observed by frequent serial X-ray films. In cases with lesions showing instability on increasing exercise, or continuing to spread, the original pneumothorax should be slowly decreased until the lung ventilates freely, attempts being made to get a selective collapse; the second pneumothorax is then induced and established along the lines suggested. Temperament and morale of the patient must be considered, also economic exigencies, for domestic and financial insecurity prejudice success. It is advisable that treatment be controlled by the same physician for as long as possible and that he be present during fluoroscopy, which should be at least once weekly. It is generally best to refill both sides at once, saving time, inconvenience and discomfort. In general, bilateral pneumothorax should be refilled on a volume basis, quantity, not pressure, being the keynote. About 25 per cent of cases developed exudates of movement. The onset may be sudden and accompanied by fever, pain and dyspnoea. The latter is generally controllable by sedatives and rarely is removal of air indicated. With large quantities of fluid, gas replacement may be performed but the precise method of handling must be decided individually—aspiration, gas replacement, decompression of the opposite side. Febrile reactions following refills are occasionally disturbing and may compel abandonment but are usually evanescent. Spontaneous pneumothorax is more alarming. The immediate treatment depends on whether cyanosis is present. Dyspnoea without it is usually relieved by morphine and reassurance. If there is cyanosis, withdraw air and repeat if necessary. Subsequent development of pyopneumothorax is a grave development. Of group *1* there have been 20 cases discharged of whom 17 were classed as fit for fairly heavy work. Of group *2* there were 22 discharged, of whom 16 reached this grade. Remote results were not too closely analyzed, but of group *1* patients, 13 were alive and 8 dead. Of those living, 6 survived more than five years after the second pneumothorax, and 6 two years or more. In group *2*, 19 patients are living and 4 dead. Of those alive, 5 survived the second induction of pneumothorax over five years, 2 two years or more and 12 are of less than two years duration. In group *1* cases this mode of treatment was the only available measure, hence a two year survival should be regarded as a good result. In group *2* the value of such treatment is more difficult to assess but the results are certainly better than if the original pneumothorax had been abandoned. Simultaneous collapse therapy is a potent weapon in proper hands. It should be more widely considered and used in England.—*Simultaneous Bilateral Artificial Pneumothorax, M. Myers & T. H. Parkman, Lancet, November 21, 1936, ccxxxi, 1207.*—(*A. P.*)

Artificial Pneumothorax in Adolescents.—The results of routine treatment of pulmonary tuberculosis in adolescent boys and girls have been such as to view the disease in this age group with pessimism. However, recent publications would indicate that artificial pneumothorax in this age group yields results that compare favorably with those in older persons. Little, at North Reading State Sanatorium, has assembled a group of 97 cases for consideration. These are the first consecutive patients so treated on whom follow-up notes could be obtained. Most of them are still receiving collapse therapy. They are compared with a group of 97 unselected cases receiving routine sanatorium treatment, the same proportion in each stage of the disease as for the pneumothorax group. With few exceptions all these patients were between 11 and 16 years of age. In each group there were 63 girls and 34 boys. Among the girls treated by pneumothorax, a successful collapse was obtained in 78 per cent of minimal, 75 per cent of moderately advanced and 38 per cent of far advanced cases; among the boys, in 78 per cent of minimal, 60 per cent of moderately advanced and 60 per cent of far advanced cases. Also, the prognosis for boys and girls receiving only routine sanatorium treatment is much less favorable than for similar groups receiving collapse therapy; 25 per cent as against 59 per cent for girls, 50 per cent as against 83 per cent for boys. In all cases with some degree of collapse of the diseased lung, clinical improvement was noted, even if a favorable prognosis could not be predicted. The figures definitely indicate the value of artificial pneumothorax in adolescents. Sex is an important factor, the female adolescent responding less favorably to collapse therapy than the male. In this, Little differs from Brock and Mullen. The amount of disease is the most important factor, even with effective pneumothorax. Artificial pneumothorax therapy is the method of choice in adolescents. In this series, 68 per cent of patients with effective pneumothorax at

present have a favorable prognosis, compared with 34 per cent among a group receiving only routine sanatorium care. The definition of "effective pneumothorax" follows that of the Committee on Artificial Pneumothorax of the American Sanatorium Association.—*Artificial Pneumothorax in Adolescents, R. R. Little, New England J. M., November 15, 1936, ccxv, 960.*—(*A. P.*)

Subcutaneous Emphysema.—Three cases of severe subcutaneous emphysema following emergency pneumothoraces for the control of profuse haemoptysis are presented. In all of them the haemoptysis stopped as soon as the emphysema developed. One of the cases, a Negro of 41, with an extensive lesion and cavity formation in the right lung, began to swell alarmingly five hours after pneumothorax had been tried unsuccessfully for a very severe and persistent haemoptysis. Air accumulated in the subcutaneous tissues from the head to the knees. The temporal regions were distended and painful. Both eyes were closed by complete distention of the upper and lower eyelids. The chest and abdomen showed large painful distention with gas, and the scrotum resembled a balloon. His voice was nasal. His figure was grotesque. Treatment was instituted by leaving two small trocars in the pectoral region for 12 hours, and by giving massage every hour, with satisfactory results and recovery in three weeks. The severe haemoptysis stopped as soon as the giant emphysema developed, and did not recur. The favorable effect of the subcutaneous emphysema on the severe haemoptyses of these patients might be due to the fixation of the chest by the pain, or to some alteration in the mechanics of circulation or respiration. The use of trocars and needles aided by massage is recommended as of definite value in this condition.—*Three Cases of Subcutaneous Emphysema as a Complication to Initial Artificial Pneumothorax, D. E. Garcia, Bol. Asoc. Med. de Puerto Rico, July, 1936, xxviii, 152.*—(*J. R. P.*)

Mechanism of Selective Collapse.—There are four general types of selective collapse. The first is associated with reexpansion of the lung after total collapse, the involved portion of lung remaining collapsed while the healthy lung reëxpands. This is not commonly seen now, because selective collapse is attempted from the very beginning of the pneumothorax. In the second type, primary selective collapse, the desired effect manifests itself from the outset of the collapse process. The third form occurs in situations where paradoxical adhesions are present over the healthy portion of the lung and absent over the involved area or lobe. Contra-electivity may occur in the presence of adhesions on the involved lobe, or where there is a massive caseous pneumonia which will not permit the almost solid lung tissue to contract. Anelectivity is the condition met with after collapse of a perfectly healthy lung, in contralateral collapse, in collapse of lungs, the seat of minimal lesions, and in lungs in which the tuberculous process is localized near the hilum. It may also occur in the presence of emphysema, and occasionally when the opposite lung has practically no function remaining. The rôle of the lesion itself in selective collapse is minimal. It is the healthy tissue about the involved area which must do the collapsing. To be sure, late in the healing process retraction does take place, and even the factor of the density and weight of the lesion may play a part if the lesion is restricted to the upper lobe. It seems rather that the alveoli adjacent to the lesion resist distension more than those in the healthy lobe, and indeed they even tend to contract. The most plausible explanation for this is that a reflex mechanism is involved similar to that observed in the muscles adjacent to the site of an injury.—*Qu'est-ce que l'électivité dans le pneumothorax artificiel et comment l'éviter, F. Cardis, Arch. Méd. Chir. l'App. Resp., 1936, xi, 341.*—(*C. L. D.*)

Significance of X-ray Control.—An artificial pneumothorax or intrapleural pneumonolysis cannot be considered successful, in spite of clinical improvement, if the roentgenogram does not show closure of the cavity. Artificial fixation of the mediastinum may make these procedures effective. Fixation may be obtained by withdrawing air under fluoroscopic control until the mediastinum is in its normal position and then injecting ten to fifteen cubic centimetres of sterile mineral oil into the pleural cavity. An effusion develops which is accompanied by a fever of 102.8° to 104°F. The elevated temperature lasts several days. Frequent fluoroscopic examinations are made until the operator is satisfied that the mediastinum is immobile. The fluid is then aspirated and pneumothorax continued as before. In many cases the tuberculous cavity will close. An illustrative case is presented.—*The Significance of X-ray in Artificial Fixation of the Mediastinum Supplementing Closed Intrapleural Pneumonolysis in Cavernous Pulmonary Tuberculosis, F. Baum, Radiol., September, 1936, xxvii, 359.*—(*G. F. M.*)

Indications for Intrapleural Pneumonolysis.—The indications for intrapleural pneumonolysis are similar to those advocated for artificial pneumothorax: open cavitation and positive sputum. In addition, the unsatisfactory collapse of diseased pulmonary tissue should be recognized even if cavitation is not evident. These indications depend on conditions coincident with the administration of artificial pneumothorax, such as continued chest pain, cough and positive sputum, the effectiveness of pulmonary compression, the location of the cavity with reference to the adhesion, the character and location of the offending adhesions, the presence of serous pleural fluid, and the stability of the mediastinum. Conversely, factors such as lung tissue and blood vessels in adhesions, noninterfering or flaccid adhesions, marked flexibility of the mediastinum, advanced contralateral lung infections and chronic empyema are contraindicative. The actual conditions within the thoracic cavity, as viewed by the thoracoscope, frequently differ from those shown on the X-ray film. Favorable operative work may be accomplished in spite of an adverse roentgenological appearance. When the pulmonary disease is of longer duration than two years, the adhesions are more organized, firm to the touch, usually short, round or fan shaped, cover considerable rib surface and frequently contain large blood vessels and lung tissue. It is the author's belief that tension on adhesions, in addition to caseous pleural areas, is important in producing pleural fluids and in developing at the insertion of the adhesion on the lung surface small lung perforations or ulcerated areas. In spite of a satisfactory collapse, when thoracoscopy reveals tension with or without cavitation and the disease is of long standing, intrapleural pneumonolysis is definitely indicated. About 22 per cent of all cases in which pneumothorax therapy is given are suitable for pneumonolysis. To produce satisfactory results it is unnecessary to sever all adhesions present.—*Intrapleural Pneumolysis in Closing Tuberculous Cavitation: Indications and Limitations, G. L. Stivers, J. Am. M. Assn., January 16, 1937, cviii, 176.—(G. L. L.)*

Pneumothorax and Surgical Therapy of Pulmonary Tuberculosis.—The only method deserving consideration here is that based on continuation of pneumothorax treatment, such methods as lung resection or cavity drainage having long ago proven fruitless. On the other hand, the pneumothorax principle has proven so effective as to encourage its further use, even when localized adhesions or adherent pleura compromise or prevent its establishment or usefulness. Many theories evolved and held as to how pneumothorax achieves its effects have proven untenable and had to be abandoned. The only theory that will withstand criticism is that of "relaxation" as the effective principle. The lung tissue cannot be stimulated to resistance by active compression but the active factors of healing must be left to the organism, merely establishing conditions under which the lung can exert its spontaneous tendency for retraction. There is really one aim: to make the closure of cavities possible by relaxing the tension of the lung. Indications for surgery only arise when there is a tendency to spontaneous retraction and when this tendency requires improved conditions for effective closure of cavities. So long as the tuberculous process is active, with fresh or spreading infiltration, major surgical intervention is more apt to do harm than good. The immunity is already strained and the added strain of operation or after treatment may lead to a serious or fatal result. Before venturing on major intervention a certain degree of demarcation of disease must have occurred and until then conservative treatment only is indicated. It is much more important that the right phase of the disease be reached than that it should be unilateral. Unilateral disease may be quite unsuited to surgical treatment whereas bilateral lesions may be suitable for treatment on one or both sides. General criteria favorable for surgery are a normal or only slightly raised temperature and stationary or increasing weight. Laryngeal and intestinal complications contraindicate only if undergoing development. But even when the general condition seems good the phase of immunity may be unsafe and other criteria are to be considered, such as blood sedimentation rate serially determined. More reliable still is the leucocytic blood picture according to Arneth or Schilling. Local criteria are to be judged chiefly by serial X-rays. In the presence of large foci of fresh infiltration, surgery should not be done. Major surgery, in general, should be kept in the background until there is evidence of demarcation and retraction and some regaining of immunity. Otherwise it should be done only on vital indications, as the only chance, usually a poor one. The theory of relaxing tension of the affected part of the lung has greatly modified technique. Total lung collapse is not now sought but instead it is aimed to secure sufficient relaxation of the affected part while allowing sound lung to function. Selective relaxation saves respiratory func-

tion and causes less invalidism. It reduces the risk and allows most operations to be done at one sitting, also extending the field to bilateral cases. The technique is individualized to effect the earliest possible closure of cavities and allow concentric retraction. The exact position of cavities and adhesions should be determined. Artificial pneumothorax is nearly always the first method to be tried. Unfortunately a very small proportion of cases is free from restricting adhesions. The method of Jacobaeus of cauterization of localized adhesions is advised early. The time ought to be past when a contraselective artificial pneumothorax is kept up for months or years. Such are not only of no benefit but often make the prognosis worse. Where cauterization is not practicable a selective thoracoplasty is advised. Oleothorax should probably be abandoned, being in disharmony with the principles of treatment and a combination of pneumothorax and local surgery is not advisable. Phrenicotomy, evulsion, injection, etc. have claimed too much attention. Used in upper lobe affections the operation is contradictory to selective relaxation. The only certain effect from paralysis of the diaphragm is markedly reduced lower lobe function. If the lower lobe is sound, this may be a serious handicap. The method is best restricted to closure of midzone, lower lobe, or perihilar cavities. Apicolysis with plombage is very selective and theoretically attractive. Serious complications, however, may occur and its effects are less than those of thoracoplasty. Its popularity is waning. Thoracoplasty is the method holding the chief place in this group of operations. More localized but intensive resections are now being done. However, the most radical relaxation from side toward mediastinum may still leave a slit-like cavity. Hence the recent tendency has been to combine it with an extrapleural or extrafascial apicolysis without plombage, allowing the apex to sink. At Vejlefjord Sanatorium, in Denmark, over 1600 cases, including pneumothorax, have been recently statistically reviewed and 100 per cent traced. Since 1916 there have been 450 cases of thoracoplasty and the results have progressively improved, with reduction in mortality. Omitting hopeless cases, the curve of those fit to work in the fifth year after discharge has steadily risen to 74 per cent, double the figure for the earliest group.—*The Surgery of Pulmonary Tuberculosis, Main Principles, J. Gravesen, Brit. M. J., August 8, 1936, no. 3944, 269.*—(*A. P.*)

Development of Thoracic Surgery.—Following an historical survey, the importance of proper selection of patients and of operative procedure is stressed. In thoracoplastic operations, one of the foremost dangers is a flexible mediastinum which may postoperatively lead to grave circulatory and respiratory difficulties. In 1924, ten years after Sauerbruch's institution of thoracoplasty, the immediate or early operative mortality for 500 cases was 3.3 per cent, although Alexander's collected statistics at this time indicated a 12 per cent mortality within four weeks. To the early mortality must be added a later figure of 16 per cent for the first few years after operation. Against the combined figures one may set a survival rate for advanced cases of only 53 per cent after one year and 22 per cent after five years. The successes achieved are gratifying. The six most important statistical reports (Archibald, Bull, Gravesen, Franke, Kayström, Schertdler) show that, out of 1,160 patients, 42.3 per cent have actively pursued their professions for a year without recurrence of disease, and Sauerbruch estimates 70 to 80 per cent permanent cures until recently, when extension of indications to a poorer type of cases has cut this to 40 per cent. Phrenicotomy, first applied in the surgery of the thoracic oesophagus, and resulting in hemidiaphragmatic paralysis and elevation, may benefit cavities in the lower part of the lung and pneumothorax with traction due to basal adhesions. As a measure *per se* it has little or no importance and throws added respiratory strain on the other lung. It has other uses than in tuberculosis. Plombage, introduced soon after phrenicotomy, makes possible a more or less localized compression and is mainly applicable to cases of bilateral cavities with severe haemorrhage, not amenable to pneumothorax. Most essential is a thorough and drastic removal of overlying ribs and callosity. Acute infections are now much more effectively treated than formerly. Abscesses must be treated with patience and if there is no definite evidence of spontaneous resolution after eight or ten weeks operation should be considered. When there is a clearly demarcated rigid wall one should no longer hesitate. These rigid cavities are usually adherent and easily opened with the cautery after removal of overlying ribs. Air embolism is not feared if positive pressure respiration is employed, compressing the weak walls of the pulmonary veins. Earlier methods to promote adhesion formation, where not found on opening the thorax, have been supplanted by plombage in suitable cases, the desired

obliteration of the pleura occurring in twelve to fourteen days, with atelectasis and shrinkage of the lung. Thus, the operative mortality from lung abscess has been cut from 50 to 68 per cent to 30 per cent, and in cases treated by plombage to 12 per cent. Obliteration of the cavity may not always ensue but bronchial fistulae and extensive cavities persist when the original abscess was large and multilocular, with a lattice work of vascularized bands covered by new bronchial epithelium. Extensive mobilization of the lung out of the diseased tissues and removal of scarred and insensitive skin is important. Their epithelial lining destroyed, the cavities are obliterated by suturing in layers. The treatment of empyema has advanced following experiences in the War and during the 1918 influenza epidemic. Where acute disturbances of intrapleural pressure dominate the picture, treatment is begun by puncture, followed by Bulan siphonage. Intercostal drainage after puncture with a trocar is obtained through a tube which ends in a vessel filled with water. Only gangrenous toxic suppurations require immediate opening of the thorax. Also mixed infections complicating pneumothorax in cases of pulmonary tuberculosis are treated by the closed siphon method. The residual cavities are later closed in ordinary empyemata by suction but in tuberculosis by extrapleural thoracoplasty, supplemented if necessary by removal of the calloused lateral chest-wall. The mortality for mixed infection empyema, originally very forbidding, has been reduced to 15 per cent. Foreign bodies in the lungs may cause few or no symptoms, at times pain and discomfort possibly associated with callous formation, and at other times haemorrhage and pus formation, these last being indications for thoracotomy and removal. The operative mortality is about 7 per cent. Cancer is still a disease usually fatal and Sauerbruch has seen no benefit from X-ray therapy. Bronchiectasis is often of congenital origin, in which case the left lower lobe is involved in 80 per cent of the cases and symptoms date from early childhood. Lotzain noted ten years ago that these bronchiectases have an arrangement similar to that of cysts of the lungs. Lobectomy after preliminary plombage is the treatment of choice. Eight or ten days after tight ligation of the pedicle the lobe is sequestrated by pressure necrosis. Sauerbruch in 1932 reported a mortality of 10 per cent in a series of 58 cases so treated. For bilateral bronchiectasis, plombage is preferred, also in young children with few symptoms. Thoracoplastic collapse is of limited usefulness and artificial pneumothorax of hardly any in these cases. Surgery of the diaphragm has developed greatly since the War. Tangential wounds of the trunk involving both thorax and abdomen are best approached transpleurally, the diaphragm being temporarily paralyzed by crushing the phrenic nerve as it lies on the pericardium. The same method is used for diaphragmatic hernias. For subphrenic abscess, transdiaphragmatic drainage is preferred. Surgery of the heart relates chiefly to wounds. The technique of stitching has been improved and knowledge of its special blood supply increased. Early exudates in the pericardium are first released by puncture but more chronic collections require wide exposure and drainage. Chronic adhesive pericarditis, causing distress and disturbance of function, may be relieved by decortication following Delormes but often rib resection is required also.—*The Development of Thoracic Surgery, F. Sauerbruch, Lancet, September 26 & October 3, 1936, ccxxxi, 723 & 775.*—(*A. P.*)

Thoracoplasty and Uncollapsible Cavities.—There is a certain percentage of failures in spite of several carefully planned stages of thoracoplasty to close firm-walled cavities in old chronic cases. The cause of failure is probably due to the character of the lung itself rather than to faulty operative technique, although a few cases fall into this classification, and are those in which there were unduly long delays between stages. The delays arise from wound infection or from pulmonary or cardiac complications. In addition to the first stage, the extrafascial apicolysis of Carl Semb has been used, but when the lung is hard and fibrous it cannot be pushed down to the fourth rib even with considerable force. Results are disappointing in this type of case. Results of reoperation have rarely been successful and the question arises whether the chance of obtaining a completely satisfactory result is worth the ordeal and risk of reoperation. A number of patients operated upon from 2 to 7 years ago, and some within the last 2 years, having open cavities, moderate amounts of sputum containing tubercle bacilli, but otherwise able to be around and enjoy life, have asked for reoperation. They have been advised against operation. There probably are some cavities that, due to the inherent quality of their walls and the surrounding lung tissue, cannot be completely collapsed.—*Difficulties of Thoracoplasty and Uncollapsible Cavities, E. S. Welles, J. Thoracic Surg., April, 1937, vi, 450.*—(*L. F. B.*)

Apicolytic Thoracoplasty.—Apicolysis is discussed in connection with thoracoplasty without removal of the first rib. Four cases are reported. This concluded that the operation is simple and more efficient than that in which the first rib is resected, the collapse is as perfect as when the first rib is removed, injury to important vessels and nerves is minimized, and postoperative scoliosis of the upper portion of the spine may be minimized.—*Conservation of the First Rib in Apicolytic Thoracoplasty, H. Lilienthal, J. Thoracic Surg., April, 1937, vi, 414.*—(*L. F. B.*)

Anterolateral Thoracoplasty.—Anterolateral thoracoplasty as performed by Morelli is directed at that portion of the pulmonary tissue which takes part in the greatest active expansion and contraction during thoracic breathing. This procedure plus phrenicotomy or phrenic exairesis puts the lung most completely at rest. The operation is simple and unattended by serious reactions. In one hundred unselected cases of pulmonary tuberculosis treated in this way there was only one fatality. In this instance death occurred four days postoperatively from bronchopneumonia. Sixty-five to 70 per cent of the cases were completely arrested following anterolateral thoracoplasty. Ten per cent were much improved both in their general condition and in the amount of active pulmonary involvement. This procedure produces a minimum of deformity of the chest. There is some diminution of the vital capacity and a more definite reduction in the complementary and reserve air. The patients tolerate exercise well and there is only very slight to no reduction in their cardiocirculatory efficiency. Anterolateral thoracoplasty does not contraindicate contralateral pneumothorax. Anterolateral thoracoplasty is indicated where there are exudative lesions with a tendency to ulceration, early infiltration, and confluent bronchopneumonia. Such processes heal readily in from five to six months. The favorable results are probably due to elimination of the exudate both by its being expelled and by absorption while the ulcerative lesions are undergoing progressive retraction until they become small fibrous or calcified nodules. This operation is also indicated where there are cavities, either isolated or associated with exudative involvement, which are capable of retraction. Recent large cavities usually will not retract because the adjacent pulmonary tissue is not sufficient to replace the space occupied by the cavity. Likewise apical and subapical cavities where most of the pulmonary tissue has been destroyed are not amenable to this procedure. Sclerotic thickened areas containing small cavities respond well to anterolateral thoracoplasty. In cases with a partial pneumothorax which has been due to adhesions, anterolateral thoracoplasty is of great value should the site of the operation coincide with the location of the adhesions. The pneumothorax can in such cases be abandoned completely. Of great value in empyema associated with pneumothorax is anterolateral thoracoplasty combined with drainage and lavage. The former will take care of therapy for the parenchymal involvement while the latter treats the complication. The anterolateral thoracoplasty should be done before complete reëxpansion of the lung has taken place. In two other types of lesions anterolateral thoracoplasty may prove valuable though it is by no means as definitely indicated as in the above. Where there is a severe ulcerocaseous pneumonic process with both destructive and evolutive changes actively present this type of thoracoplasty may retard the progress of the disease. Old cavities with rigid walls may be partially collapsed by incomplete anterolateral thoracoplasty.—*Résumé de trois ans d'études sur la cure de la tuberculose pulmonaire par la thoracoplastie antéro-latérale, V. Monaldi, Arch. Med. Chir. l'App. Resp., 1936, xi, 174.*—(*C. L. D.*)

Effect of Sterilizing Operating Room Air upon Thoracoplasties.—An extensive study has been made at the Duke Hospital in order to réduce the number of operative wound infections. No positive growth of *Staphylococcus aureus* was obtained except from the floors, walls or ceilings of the operating rooms. A blood agar plate exposed for one hour in any operating room, while in use, and cultured for 24 to 48 hours should show many colonies. Repeated cultures of air entering the operating rooms showed it to be practically sterile. The degree of contamination of the air was higher when the room was occupied than when unoccupied although in the latter case the air was agitated with electric fans. The number of wound infections was reduced from 60 to 90 per cent by: wearing masks at all times, barring known chronic carriers of pathogenic bacteria from the operating rooms, visitors and students not allowed, reducing the personnel to a minimum, frequent washing and painting of the rooms, forced ventilation with clean washed air from the roof, and performing major operations before the room had been long occupied.

A source of radiant energy, constructed by the Westinghouse Lamp Company, producing wavelengths capable of destroying bacteria and still having few detrimental effects upon the skin, was installed. With this lamp, lightly sprayed cultures of *Staphylococcus aureus* were killed in 60 seconds at a distance of 5 feet. Heavily sprayed cultures of an unfiltered suspension of *Staphylococcus aureus* required over 2 and less than 5 minutes for destruction of all but one colony, at a distance of 5 feet. At 10 feet distance less than 30 minutes exposure were necessary. In 110 thoracoplasties performed without radiation there were: 4 deaths from infected wounds, 33 per cent of the cases had infected wounds, average postoperative temperature was 38.5°C., 32 per cent of the cases had a temperature of 38°C., or below, average duration of temperature was 9 days, and 87 per cent of the cases had a temperature for 4 or more days. In 18 thoracoplasties performed in a field of bactericidal radiation there were no infected wounds and no deaths due to them; average postoperative temperature was 37.5°C., temperature of 72 per cent of the cases was 38°C., or below, average duration 2 days, and 33 per cent for 4 or more days. With radiation, convalescence was unusually smooth, no infection, lower and shorter period of temperature elevation, less pain, more rapid healing and quicker return to preoperative general condition.—*Sterilization of the Air in the Operating Room by Special Bactericidal Radiant Energy, Results of Its Use in Extrapleural Thoracoplasties, D. Hart, J. Thoracic Surg., October, 1936, vi, 45.*—(*L. F. B.*)

Economic and Social Value of Thoracic Surgery in Pulmonary Tuberculosis.—The author gives a brief outline of methods and indications for collapse therapy. While for the near future artificial pneumothorax which is an easy and almost everywhere available procedure will probably remain the most frequently applied form of collapse therapy, the necessity is emphasized of a more wide-spread acquaintance of the medical profession with thoracic surgery. It is pointed out that surgery should not be reserved for those cases where artificial pneumothorax cannot be induced, but that surgical methods should be used more frequently on social and economic indications as a means of shortening the duration of the treatment. Since the hospital accommodations for such a purpose are limited in Mexico at the present time, there is a social situation which calls for thoracic surgery. Therefore a much larger number of physicians must become familiar with the technique of artificial pneumothorax and the performance of minor thoracic surgery. At the same time they must familiarize themselves with the prospects of major thoracic surgery. In view of the few hospitals where equipment and training for major surgery is available the author suggests transferring patients from the country into the surgical centres. He emphasizes the necessity of a careful discrimination between the various indications for major surgical procedures.—*La importancia economica y social de la cirugia de torax en la tuberculosis pulmonar, D. G. Alarcon, Medicina Rev. Mexicana, December 25, 1936, xvi, 577.*—(*F. G. K.*)

Phrenic Interruption.—The study is based on 95 cases, followed from six months to four and a half years after operation, with a view to clarification as to what type of case is suitable for this operation as an independent procedure. Of the 95 cases, 68 were in the group in which phrenic operation was used solely for treatment of the cavernous or infiltrative-cavernous form of disease. In all cases pneumothorax had been attempted and abandoned because of pleural symphysis or extensive adhesions. In 30 cases the lesion was of such nature that either an unfavorable or no change might be expected following operation, and in 38, the parenchymal changes were such that various degrees of favorable results might be expected. Pulmonary lesions not manageable by pneumothorax that require more radical surgery than phrenic interruption are: huge cavities, occupying the entire apex with its walls adherent to the parietes of the chest, thick walled cavities, cavities embedded in a fibrous infiltrate, peripherally located adherent cavities, lesions within a lung surrounded by a thick pleura, and multiple cavities. Favorable results should be expected in cases of small or moderately large cavernous lesions with a surrounding zone of lung tissue more or less free of infiltrate and a cavity within a shrinking lobe where the surrounding infiltrate is not extensive and the cavity is smaller than it was originally. In the 38 suitable cases, the cavity closed in 20, was reduced in size in 12, and unaffected in 6. In 9 cases subjected to thoracoplasty following ineffective phrenic paralysis, the cavity closed in 5, partially closed in 3, and 1 patient died. More cavities closed following phrenic operation when there was moderate or marked elevation of the diaphragm. In the 20 effective phrenemphraxes the interval between operation and cavity closure averaged seven and one-half months. A knowledge as to whether the lesion was

anterior or posterior added little, if any, to the prognosis. In 12 pneumothorax cases, the collapse became effective following phrenic interruption in 6. Most satisfactory results were obtained in cases in which the lung was suspended between the apex and diaphragm. Phrenic interruption alone has a definite place in treatment in selected cases. While more advanced disease can be managed only by pneumothorax or thoracoplasty, diaphragmatic paralysis, in suitable cases where pneumothorax has failed and thoracoplasty is contraindicated, is not infrequently effective in combating the disease. Phrenic interruption is valuable as a supplement to an ineffective pneumothorax and to reduce the size of the pleural space following cessation of pneumothorax treatments.—*Phrenic Interruption in the Treatment of Pulmonary Tuberculosis, B. P. Potter, F. B. Berry & F. Bortone, J. Thoracic Surg., April, 1937, vi, 424.*—(*L. F. B.*)

Phrenic Neurectomy Combined with Artificial Pneumoperitoneum.—It is proposed that artificial pneumoperitoneum be combined with phrenic neurectomy in the treatment of those cases of pulmonary tuberculosis in which artificial pneumothorax is unsuccessful because of extensive adhesions and thoracoplasty is contraindicated. The effect of diaphragmatic paralysis can be enhanced by the introduction of air into the peritoneal cavity and introduces a sufficiently effective pneumatic splint to compress the diseased lung from the undersurface of the diaphragm. The left upper quadrant of the abdomen is selected and an initial injection of from 500 cc. to 800 cc. of air is introduced. Refills are given at from 3- to 14-day intervals depending upon the degree of rise in the height of the diaphragm. For 2 to 3 days the patients complain of pain in the shoulder on the unparalyzed side and near the mammary line in the infraclavicular area. The method proposed is being tried and satisfactory results are being obtained. The term "artificial pneumoperitoneum" should be used to distinguish it from spontaneous pneumoperitoneum.—*Use of Phrenic Neurectomy Combined with Artificial Pneumoperitoneum for Collapse of Adherent Tuberculous Lung, M. Joannides & O. C. Schlack, J. Thoracic Surg., December, 1936, vi, 218.*—(*L. F. B.*)

Bilateral Lobectomies.—Bilateral lobectomies are still rare enough so that the successful completion of one justifies reporting it. A 17 year old girl presented signs and symptoms of bronchiectasis involving the lower lobe of each lung. The left lower lobe was removed at a one stage operation of the Brunn-Shenstone type, using spinal anaesthesia, on April 17, 1936. On May 7 the patient was up walking and on June 11 the right lower lobe was removed using the same technique. The patient's condition was much improved after the operation. Emphasis is placed on having the patient in good condition before operation.—*Bilateral Lobectomy for Bronchiectasis, I. Lewis, Brit. J. Surg., October, 1936, xxiv, 362.*—(*H. W. H.*)

Total Pneumonectomy.—Certain patients with unilateral pulmonary disease not amenable to other measures, ordinarily with a hopeless outlook, may be relieved or cured by this operation. Glück in 1881 demonstrated the possibility of successful extirpation of an entire lung experimentally. In 1911 Kümmell performed such an operation in man without success and Meyer, Lilienthal and Archibald repeated the attempt. It was never successful until 1931 when Nissen, in Sauerbruch's clinic in Berlin, resected the entire left lung of a girl of 12 suffering from bronchiectasis following trauma. In 1932 Haight, in Alexander's clinic in Michigan, removed the entire left lung of a girl of 13 with bronchiectasis following foreign body aspiration. Additional successes since reported have dealt mostly with new growths. This paper is based on 6 cases of bronchiectasis with total extirpation, 4 successfully. Indications include pulmonary gangrene, suppuration, tuberculosis and new growth. Suppurative conditions include congenital multicystic lung, unresolved pneumonia, multiple abscesses and associated bronchial dilatation. So called "dry" cases are apt to be better risks than "moist" or "wet," and in those with haemoptysis or previous "wet" incidents there are special indications. Preliminary constitutional treatment and postural drainage are recommended but not over too long a period. Where there are large saccular cavities and contralateral ones are shown by bronchography, collapse therapy is preferable. Tuberculosis, when strictly unilateral, offers scope for this operation. Macewen's case, reported in 1895, was of this nature. It is now recognized that collapse therapy is unsuited to the predominantly exudative lesions but more radical measures offer some hope. Reinhoff, in 1935, has successfully resected an entire lung for tuberculosis. New growths have been successfully dealt with by Graham, Archibald and Reinhoff in this way. *Technique:* Anaesthesia is by chloroform or ether and oxygen, using the intratracheal method. With young patients, avertin is

employed as a preliminary basal narcotic; in older subjects, omnopon-scopolamine. Approach is usually by a posterolateral intercostal incision, with forcible separation or partial resection of certain ribs. Exteriorization of the lung has now been practically discarded. Details of removal: (*1*) Dissection of pedicle. This is the most radical method and suited especially to neoplastic disease. Reinhoff performed five operations with this technique. Preliminary artificial pneumothorax is helpful. Adhesions or induration make it difficult. (*2*) Brunn-Shenstone lobectomy technique. The pulmonary pedicle is controlled by a tourniquet or clamp and the lung amputated slightly beyond this. Haemostatic and stay sutures transfix vascular and bronchial elements and some parenchyma is sutured to cover the stump. Air-tight drainage is provided by a separate wound below. Graham, in 1933, used this technique for a case of bronchial carcinoma, the first successful one-stage pneumonectomy with chest closure. Mason used the method in 3 cases. (*3*) Two-stage method. Disadvantages: More than one severe operation is necessitated. There is a foul suppurating wound and prolonged serious illness. Deformity is apt to be greater and supplementary thoracoplasty often is necessary. *Difficulties and Complications:* (*1*) *Haemorrhage:* This may be primary or secondary and is especially a danger near the pulmonary pedicle. Secondary haemorrhages are usually associated with separation of sloughs. (*2*) *Shock.* (*3*) *Air embolism:* This caused 2 deaths in Mason's series and was due to aspiration of air into a pulmonary vein torn near the hilum. It should be preventable. (*4*) *Lung root reflexes.* During manipulations at the interlobar fissure at the hilum and when mass ligatures were tightened, O'Shaughnessy has observed curious bodily jerks, apparently violent expiratory movements, along with distension of the auricles of the heart and cessation of aortic beats. These are probable vagus-nerve reflexes and are prevented by novocaine infiltration between stimulated joint and mediastinum. (*5*) *Delayed reflex phenomena:* These include tachycardia, dilatation of right heart, acute oedema of contralateral lung, asthmatic wheezing. Increased mechanical strain may play a part. (*6*) *Bronchial fistulas:* Most patients develop one at some time during convalescence. The danger is greatest in an infected cavity with poor drainage. Direct external communications are rarely dangerous. (*7*) *Tension pneumothorax:* The onset is sudden and occurs where pleural drainage has not been employed or has ceased. It must be reestablished promptly. *Effects on the chest:* Experimentally the mediastinum moves toward the operated side. To a less extent the chest-wall falls in and diaphragm ascends. A residual pneumothorax persists between axilla and mediastinum, its base on the pleural dome. If a major bronchial fistula persists a thoracoplasty is required. Six cases are fully reported, with photographic, roentgenographic and pathological reproductions to illustrate them, also drawings. Reinhoff's technique is favored where there is no reason to suspect adhesions or induration around the hilum, for example, probably limited to certain neoplastic and tuberculous cases. If the patient's condition is grave, mass ligation at the hilum must be used, otherwise amputation and suture of pedicle are done. Mortality is less with the two-stage operation.—*Extirpation of the Lung, G. A. Mason, Lancet, May 2, 1936, ccxxx, 1047.*—(*A. P.*)

Ligation of Pulmonary Veins.—Based upon the work of Rudolph Valkani and other experimental work in creating hyperaemia and stasis in the lungs, the author reports the results of ligation of pulmonary veins in 11 patients with cavernous tuberculosis. The technique is as follows: one hour before operation an injection of morphine is given; the operation is performed intrapleurally (extrapericardially) under local anaesthesia ½% novocaine. An incision is made on the right or left along the third rib, beginning at the midsternum, for a distance of 9–11 cm. The cartilage and exposed portion of the rib is freed of the perichondrium and periosteum and resected. The periosteum and parietal pleura are sectioned longitudinally. If the adhesions in that region are numerous and massive and require sectioning, the internal mammary artery is ligated and cut. Blunt dissection is done as in an open pneumonolysis and only very heavy adhesions are cut between ligations. The freed mesial section of the lung is reflected laterally with fenestrated forceps. Blunt dissection is carried towards the root of the lung and again thick adhesions are cut with great care to avoid injury to the lung tissue or vena cava. The operative field is bathed in ½% novocaine to prevent vomiting, tachycardia and a feeling of pressure on the chest which results from irritation of the phrenic nerve during the manipulation. When the root is reached, the heart and mediastinum are gently held back medially with a retractor. Two to 4 cc. of novocaine are injected under the pleura of the root of the lung and the pleura opened with scissors. The connective tissue is separated and the first structure that comes into view is the pulmonary vein. It is recognized

by its easy compressibility. The artery and bronchus lie higher and more posteriorly. The branch leading to the lobe in which hyperaemia is to be produced is isolated by blunt dissection. A heavy silk ligature is then passed under the isolated vein with a Dechampa needle and the ligature is very gently tightened, avoiding injury to the vein, until the lumen is occluded. Pressure on the bronchus should be avoided because it produces severe cough. Novocaine bath should be used freely. The operating field is dried well, the edge of the lung is brought against the medial surface of the wound and held in place with two or three sutures, the wound is tightly closed without a drain and a pressure bandage is applied. Good illumination of the operating field is essential. All the patients had cavitary lesions with positive sputum and pneumothorax was either impossible for lack of free pleural space or it was ineffective. All the patients stood the operation well. A slight rise in temperature the first three days, post-operative, was noted in all cases, also blood-tinged sputum in some. One patient developed a paramediastinal empyema and bronchopleural fistula which necessitated resection of the fourth rib. The empyema cleared following open drainage and irrigation. Roentgenograms showed marked haemorrhagic congestion in all cases and later dense fibrosis with closure of cavities and negative sputum. *Conclusions:* (*1*) Ligation of a branch of the pulmonary vein does not cause any serious disturbance in the body as a whole. (*2*) It creates marked clinical improvement in the patients and the sputum either becomes negative or the bacillary content is markedly decreased. (*3*) In markedly destructive processes involving more than one lobe, ligation may be used to decrease toxicity and expectoration, permitting building up of the patient preparatory to thoracoplasty.—*Ligation of the Pulmonary Veins as a Method of Curing Tuberculosis of the Lungs by Congestive Hyperemia, L. K. Bogush, Probl. Tuberk., January, 1937, no. 1, 59.*—(*W. A. Z.*)

Pulmonary Abscess.—This condition is not uncommon and with the help of the X-rays may be accurately diagnosed at an early stage in a high proportion of cases, providing its existence is kept in mind. The most satisfactory definition of lung abscess is "nontuberculous suppuration with cavitation occurring in the lung tissue," which makes it clear that the lesion is in the pulmonary parenchyma and differentiates it from large bronchiectatic cavities. The term gangrene is better avoided in the case of primarily infective lesions and reserved for the type of abscess resulting from anaerobic infection, or still better, for those cases where there is necrosis resulting from vascular obstruction, or else abandoned altogether. *Aetiology:* 1. Respiratory tract lesions: (a) in the oropharynx, after tonsillectomy or dental extraction; (b) larynx or trachea, postoperative; (c) in the bronchi, foreign body, carcinoma, bronchiectasis; (d) in the lungs, pneumonia, actinomycosis and rare fungus infections; (e) chest injuries. 2. Abdominal conditions, post-operative, especially associated with infection. 3. Peripheral septic conditions: cutaneous, puerperal, aural infections, osteomyelitis. 4. Lesions of the nervous system. 5. Primary: The actual pathogenesis is still disputed. Some hold that most cases are due to aspiration of infected material; others that septic emboli in branches of the pulmonary artery are more frequent. Animal experiments indicate that abscess is more certain to occur when there is associated lung damage as well as infection. In cases resulting from upper abdominal infection there is liver suppuration in a high proportion. *Symptoms and signs:* Often the symptoms are merely those of an acute infection with little localizing evidence. The onset may be sudden and febrile with possibly a chill or dry cough and pain especially where the process is near the pleura. The sputum varies, is often little or none, and foul only where there is fusospirochaetal infection. Slight haemoptyses are common in the early stages and suggestive of a parenchymal lesion. The physical signs vary with the stage and location of the process and may be entirely absent with deep-seated lesions. When there is bronchial communication the signs change with the fluid content of the cavity and are increased after coughing. Clubbing of the fingers may occur early, within a few weeks, and is commonly present in chronic cases. Cough and large quantities of sputum precipitated by change in posture always suggest a cavity containing fluid. *Sequelae and complications:* Pulmonary complications are congestion, bronchopneumonia, and in more chronic cases fibrosis with bronchiectasis. Pleural effusion, clear or purulent, may occur, or pyopneumothorax due to rupture of the abscess into the pleura. Complications elsewhere are due to metastatic infection, for example, acute pericarditis and septic endocarditis, and cerebral abscess, always to be feared. In chronic cases amyloid disease may occur. *Diagnosis:* Sputum examination is most informative in the fusospirochaetal cases. The roentgenographic appearance is fairly characteristic, usually showing a rather circular

well defined shadow with a fluid level; where this extends to the chest-wall it may be mistaken for a pyopneumothorax but usually a thin rim of intervening lung tissue can be visualized. A lateral view in these cases may be of great value. A breaking down carcinoma may cause confusion but the lesion is rarely so well defined and circular. Lipiodol examination is sometimes of value in distinguishing abscess from a large bronchiectatic cavity. In abscess, inflammatory swelling usually occludes the entering bronchus and the lipiodol is seen to flow all around an opaque area, whereas in bronchiectasis there is nearly always free communication between a cavity and an adjacent bronchus. As a rule an initial bronchoscopy is desirable especially in middle aged adults and very young children, to eliminate the possibility of a carcinoma or foreign body. Exploration of the chest with a needle in suspected lung abscess is a procedure open to grave objection and should rarely be done. *Treatment:* A simple classification is suggested, also of value in determining treatment. Conservative or medical treatment for at least eight weeks before even considering surgical procedures is a good rule, the only exceptions being in some very acute, rapidly advancing cases. Under bed-rest spontaneous healing may occur or rupture into a bronchus, followed by healing. Also, the period of rest is useful to assist drainage of the abscess cavity and combat the infection. Postural drainage assists this, the exact posture to be adopted depending on location and topography. It is less beneficial in peripheral than central abscesses. Some advocate routine bronchoscopic suction or lavage but the evidence in the more acute cases is unconvincing. The main uses of bronchoscopy are for removal of foreign bodies or recognition of underlying malignant disease. In a few cases it helps to establish drainage. Artificial pneumothorax is not recommended where the abscess is located near the pleura nor in cases where free drainage has been established except in deep-seated central abscesses slow in healing. Surgical indications are chiefly peripheral chronic abscesses not draining well. A simple two-stage thoracotomy and drainage is most satisfactory. Pneumonectomy and lobectomy are indicated only in very chronic resistant cases and are formidable procedures. Phrenic evulsion is rarely indicated and thoracoplasty has gone out of favor except for very extensive lesions. Multilocular abscesses can be drained as well as unilocular. The after-treatment is important in avoiding bronchopleural fistula. The essence of successful treatment is prevention, and next early treatment, by which means the number requiring surgery will greatly diminish.—*Lung Abscess, J. Maxwell, Lancet, August 22, 1936, ccxxxi, 413.*—(*A. P.*)

Pathogenesis of Putrid Lung Abscess.—The mouths of 115 unselected cases of putrid lung abscess were systematically examined with a view to determine their hygienic status. They were arbitrarily classified as 1 plus to 4 plus, the latter representing the typical neglected septic mouth. Mouths classified as 3 plus and 4 plus were considered septic. Patients with pulmonary abscess of unknown aetiology showed a strikingly high percentage of septic teeth and gums. Of the 115 cases, 64.4 per cent were of unknown aetiology and 84 per cent of these presented septic mouths. The number of cases with dental and gingival pathology increased decidedly with succeeding age groups as did the incidence of putrid lung abscess, particularly of the unknown aetiology type. In a control group of 100 unselected cases referred from medical wards, 12 per cent were classified as having septic mouths. In a second group of 50 cases in the chest follow-up clinic, none of whom had lung abscess, 14 per cent were classified as having septic mouths. In view of the high incidence of septic mouths in the cases of putrid lung abscess of unknown aetiology, and that the infected material adherent to the teeth was easily dislodged and could be aspirated during sleep, it is believed that a reasonable explanation of the pathogenesis of these cases is presented. The characteristic lesions of gums was disproportionately common only in patients with putrid lung abscesses of unknown aetiology.—*Etiology Factors in the Pathogenesis of Putrid Abscess of the Lung, L. Stern, J. Thoracic Surg., December, 1936, vi, 202.*—(*L. F. B.*)

Nontuberculous Pulmonary Abscess.—Ninety cases of nontuberculous localized pulmonary abscess were treated at the Peter Bent Brigham Hospital between 1914 and 1934. Eighty-five have been followed from 2 to 22 years. Although not restricted to any age the greatest incidence corresponds roughly to the greater number of middle-aged people seen on the general surgical and medical services. The incidence was about twice as high in men as that in women, 61 and 29, respectively. Of the 90 cases, 54 per cent followed some surgical procedure, 28 per cent followed pneumonia, 4 per cent followed bronchiectasis and in 14 per cent aetiology was open to question. In most of the postoperative cases clear cut evidence

in support of aspiration or embolism as the aetiological mechanism was lacking. The lobes of the lung involved were: right upper in 26 cases; right middle in 5; right lower in 21; left upper in 22, and the left lower lobe in 16 cases. The widely scattered distribution is rather in favor of the embolic theory of their pathogenesis in many instances. Only those cases are listed as cured who showed complete healing of the cavity by X-ray and who have no residual symptoms. Of the 90 cases, 43 received medical treatment and 38 of these have been followed. Of this group, 20 were cured, 7 improved, 1 unimproved and 10 died. One case died of uremia and another of cerebellar neoplasm. In 47 cases surgery was employed at some time during their treatment. Of these, 16 were cured, 6 improved, 3 unimproved and 22 died. Seven deaths were due to a complicating factor. In the 1915 to 1919 period 27 per cent of cases were satisfactory while 73 per cent were unsatisfactory or dead. Between 1930 and 1934, 66 per cent were satisfactory and 34 per cent were not. Medical treatment consisted of postural drainage and symptomatic supportive treatment. There was no striking benefit in spirochete and fusiform bacilli cases with the use of arsphenamine. Collapse therapy of any kind was tried and abandoned. The most important single surgical procedure used was simple external drainage done in 1 or 2 stages. Vertical incisions apparently tended to remain open longer and permit better drainage than horizontal ones. In general young adults had a more favorable prognosis. The position of the abscess was less important in prognosis but in this series those involving the right lower or left upper lobe were more favorable. It is suggested that operative manipulations be gentle and mass ligatures avoided in order to reduce the hazard of pulmonary infarction by embolism and adequate oral hygiene be instituted before operation. Postural drainage should be tried for at least six weeks in all cases and, in those cases not responding, operative drainage should be instituted.—*Nontuberculous Abscess of the Lung, E. C. Culler & R. E. Gross, J. Thoracic Surg., December, 1936, vi, 125.*—(*L. F. B.*)

Treatment of Lung Abscess.—An extensive bibliography of articles in the English language is offered in this study of 100 consecutive cases. Of the 100 cases, 24 followed operation on the respiratory tract, 10 followed other operations, 18 were attributed to pneumonia, and in 48 the aetiological factors were of a wide variety. Anaerobic organisms were found in approximately 80 per cent of the cases. The most frequent early symptom was pain over the site of the abscess. Other symptoms were: varying fever, foul pus-laden sputum, clubbing of fingers, anorexia, loss of weight, sweating and cough. Eighty-one of the group were males and 19 were females. The third, fourth and fifth decades provided 75 cases, the fourth having the greatest number with 34. Diagnosis is often difficult. The use of an exploratory needle is extremely dangerous and exploratory thoracotomy seems unjustifiable. Conservative treatment (postural drainage, pneumothorax, phrenic surgery, neoarsphenamine and ordinary supportive measure) was given in 55 cases. Of these, 30 are well, 9 improved, 2 unimproved, and 14 died. Surgical treatment was done in 45 cases, 29 having drainage by the two-stage operation. Of these 29, 14 are well, 3 improved and 12 died. In a series of 2,114 cases reported in the literature, 51.4 per cent were treated conservatively with a mortality of 34.4 per cent and 48.6 per cent were treated by radical surgical procedures with a mortality of 34.2 per cent. In the present series the mortality rate was 34 per cent, being 42 per cent for the first 50 cases and 26 per cent in the last 50 cases. Of the 34 deaths, 6 were due to carcinoma making the mortality of the remaining 94 cases, 29.7 per cent. Conservative treatment should not be continued unless progressive improvement is seen regardless of the time element. Phrenic nerve crushing is sufficiently valuable to be used in certain cases. It is of no benefit if satisfactory bronchial drainage is not already established. Treatment with arsenicals deserves a wider trial. Bronchoscopic drainage has not proved of great value in most hands except as a diagnostic procedure or in those abscesses due to foreign bodies. Pneumothorax treatments are unjustifiable. Operative drainage should always be done in 2 stages and wide area for drainage established. It should be made with the actual cautery. Tube drainage complicating empyema is sometimes of value where the patient's condition does not permit a more radical operation.—*Treatment of Lung Abscess, C. I. Allen & J. F. Blackman, J. Thoracic Surg., December, 1936, vi, 156.*—(*L. F. B.*)

Pulmonary Abscess.—Postoperative pulmonary suppuration has become more prevalent in the last three decades. The two main pathogenetic theories are that the abscess is caused by aspiration of infected material from the upper air passages via the bronchus and that the abscess is initiated by emboli lodging in the pul

monary parenchyma. The "aspiration" protagonists, judging from the literature, are in the majority. The arguments in favor of this theory are: bacteriologically the flora of pulmonary abscesses is similar to that found in the patient's oral cavity; bronchoscopic evidence shows that following tonsillectomies, both under local and general anaesthesia, pus and blood find their way into the upper bronchi, and cultures of this material actually demonstrate microörganisms that are often found in abscesses; the right lower lobe is more frequently involved because of its straighter bronchus; and suspensions of material removed from the teeth and tonsils have produced abscesses when experimentally introduced into the bronchi of animals. The arguments in favor of the embolic theory are: the relative ease and constancy with which abscess can be produced in animals by freeing infected emboli in the venous blood-stream; infarction in the lung, in minor and major forms, is a relatively frequent postoperative accident and when such infarction occurs it is relatively more frequent in the lower lobes than in the upper, and more often in the right lower than the left in the ratio of 4 to 3; thrombosis is much more frequent in operative areas that are actively or potentially infected; embolus is more frequent where movement of the parts cannot be avoided, like throat, abdomen, etc. However, it is generally recognized that if experimental lung abscess is produced by any one of the common pyogenic bacteria, it will be of minor importance and will readily heal. Therefore, if pulmonary abscess is caused by an embolus from an operative field, why does the abscess flora simulate the mouth flora rather than the type of microörganisms found in the original wound from which the emoblus originated? Presumably as soon as the abscess ruptures into a bronchus contamination with mouth microörganisms takes place and this is responsible for the typical chronic, thick-walled abscess that is usually seen in man. The theory is therefore resuggested that the abscess is initiated by infected embolus and propagated by bronchogenic contamination if it ruptures into a bronchus. This would account in the embolic theory for the disparity often existing between the bacterial flora of the abscess and that of the operative field, and would explain why, although abscesses do contain such flora, the transportation of microörganisms native to the mouth into the lung only rarely causes abscess formation. Thus the main obstacle of each hypothesis taken alone is removed by combining the two. Diptheria would seem to be a good disease in which to test the aspiration theory, for in laryngeal diphtheria there is practically complete abolition of laryngeal reflexes. A study was therefore made on the wards of the Willard Parker hospital in New York. No cases of pulmonary abscess developed following laryngeal paralysis or intubation. The autopsy protocols of 100 diphtheria deaths were also studied. Although membranes were found down to the smallest arborizations of the bronchial tree, and Tull has shown that these membranes contain many of the mouth microörganisms, no abscesses or areas of pneumonitis were found. However in 3 out of 85 cases that had had tracheotomy, pulmonary abscess had developed. The additional factor here was incision with its potentialities of thrombus and embolus formation. Again this is illustrated in tonsillectomies. Pulmonary abscess occurs as a complication with greater frequency in the modern operation of tonsillectomy than in the days of tonsillotomy. Aspiration possibilities obtain in both types of operation, but injury of the surrounding venous plexus with attending danger of ensuing infected thrombi occurs only in the former operation. The prophylaxis of abscess should therefore include measures designed to prevent thrombosis as well as aspiration. As regards therapy of pulmonary abscess, earlier surgical drainage is urged in the fulminating types. The use of drugs and vaccines is of no value. Pneumothorax should be used only as a localizing diagnostic measure. Postural drainage must be used cautiously in acutely ill patients. If surgical treatment is postponed until a chronic stage has been reached, more radical surgery, with its higher mortality, is required to effect a cure. Case reports are presented illustrating these points. —*Postoperative Lung Abscess, J. V. Bohrer, Am. J. Surg., January, 1937, new series xxxv, 64.*—(*A. E. M.*)

Experimental Pulmonary Abscess in Monkeys.—A method is described for the production of pulmonary abscess in Java monkeys (*M. irus*) by the bronchial route. The infectious material was obtained at operation from the lung of a patient with chronic pulmonary abscess, and the anaerobes which it contained (*Bact. melaninogenicum*, spirochetes, various types of fusiform organisms and gram-negative bacilli of the Bacteroides group, as well as anaerobic streptococci, etc.) were kept alive by frequent passage through the inguinal tissues of guinea pigs. With the aid of a fluoroscope and a radiopaque ureteral catheter, the purulent infected exudate which was removed from the inguinal lesions of the

guinea pigs was introduced directly into the bronchus of the lower lobe. The bronchus of one lung was then plugged by means of melted agar in order to prevent expulsion of the bacteria during cough. In six of fourteen animals thus infected there developed large putrid abscesses and in two pneumonia, while in the rest the results were essentially negative. The progress of these lesions was followed during life by frequent roentgen examinations and checked by means of histological sections after necropsy. Control experiments with heated pus and agar alone produced atelectasis and pneumonitis but no evidence of pulmonary suppuration. In only two of the six monkeys which showed abscesses at autopsy was it possible to diagnose the condition by means of X-ray films during life. This is similar to the usual clinical experience. The haematological and temperature changes likewise were not sufficiently constant to be of diagnostic value. Bacteriological and histological examinations were made of the organs of monkeys with experimental pulmonary abscesses and of control animals. The details are given in the text. The evidence presented suggests that pulmonary abscess may be due in certain cases to aspiration into the bronchioles or alveoli of infectious material derived from the upper respiratory passages and plugging of the corresponding bronchus. The rôle of pulmonary atelectasis and of bacterial toxins in paving the way for saprophytes and opportunists is discussed. (Authors' Summary.)—*Experimental Pulmonary Abscess in Monkeys, C. Weiss & M. C. Shevky, Arch. Path., December, 1936, xxii, 770.—(J. S. W.)*

Bronchiectasis.—The importance of diagnosing bronchiectasis lies in the fact that it is a common disease and nearly every patient having it at one time or another will be diagnosed as having tuberculosis. Most cases are nontuberculous and are chiefly due to infections. Some are due to obstruction, but even in these infection is probably the main factor in the dilatation. The early pathology consists of inflammation of the mucous membrane and, later, of the entire bronchial wall. If the disease is arrested at this time there is still a possibility of its return to normal, but if it proceeds to atrophy, especially of the muscle and elastic fibres, return to normal is impossible and dilatation may occur, especially if aggravated by partial obstruction and coughing. Early symptoms are easily overlooked, so when a cough is severe enough to take the patient to a doctor, he should be thoroughly examined, tuberculosis ruled in or out, and X-rays taken. Early and moderately advanced cases may show little change in the X-ray especially if the disease is behind the heart. However, a definite diagnosis must and can be made, not only as to the presence of bronchiectasis, but as to its location and extent. This may be done by bronchography in addition to the X-ray. The supraglottic, intratracheal and transcutaneous methods of using iodized oil are described. Cases and roentgenograms are presented to illustrate the striking and conclusive findings in bronchography. It is pointed out that triangular areas seen at the base are frequently atelectatic lobes containing bronchiectatic dilatations and that symptoms and signs of the disease may be referred to areas into which drainage is occurring rather than to the actual site of the disease. Treatment consists mainly of elimination of infections of the upper respiratory tract, removal of any foreign body if that is the cause, postural drainage, bronchoscopic drainage, with and without steam inhalations, creosote to decrease bronchial irritation and injection of iodized oils about once a month. If the disease is unilateral, pneumothorax may be used. Phrenicectomy may be employed later if pneumothorax collapse is not satisfactory. In selected cases pneumonectomy or lobectomy may be resorted to and these are the only methods by which the disease can be permanently cured.—*Bronchiectasis: Its Diagnosis and Treatment, A. C. Christie, Rad., February, 1936, xxvi, 138.—(G. F. M.)*

Roentgen Therapy of Bronchiectasis.—Roentgen therapy in large dosage was instituted by the authors in a series of cases of chronic secreting bronchiectasis. No acute cases or cases with recent onset were treated. There were fourteen patients with chronic bronchiectasis secondary to chronic (operated) anaerobic lung abscess. There were three patients with chronic bronchiectasis characterized by moderate amounts of nonfoul expectoration, and there were thirteen patients with chronic bronchiectasis characterized by profuse foul expectoration. These patients with multilobar bronchiectasis and profuse expectoration of large quantities of foul expectoration, although the most seriously ill, have experienced the greatest benefit and have shown the most striking results and remarkable improvement. In some of the cases that have been treated successfully, posttherapy bronchography has shown alterations in the picture of the dilated bronchial tree. The bronchi that were definitely dilated (saccular and cylindrical), which were exposed to roentgen therapy, appear narrowed and

strictured throughout after treatment. It may be reasonably conjectured that such a change is due to healing by scar tissue of the previously ulcerated diseased bronchial tree. The morphological type and degree of the dilatations (cylindrical or saccular) have had no demonstrable relationship to the results of roentgen therapy. No evidence of pleural thickening, pulmonary fibrosis or mediastinal retraction has been noted. It is the opinion of the authors that roentgen therapy in moderately large dosage as the sole method of treatment for chronic secreting bronchiectasis is feasible and successful, resulting in great symptomatic improvement in a considerable proportion of cases. The clinical improvement with moderately high dosage of roentgen therapy may be so great in many cases as to approach a practically complete cessation of the symptoms of expectoration and cough. Follow-up examination over a period of two years in the nineteen cases in which there has been improvement has shown no recurrence of symptoms with infections of the upper respiratory tract.—*Roentgen Therapy for Bronchiectasis, M. Berck & W. Harris, J. Am. M. Assn., February 13, 1937, cviii, 517.*—(*G. L. L.*)

Lobectomy in Bronchiectasis.—The development of lobectomy has been largely responsible for the success of surgery in the treatment of bronchiectasis. Excision of the diseased area is at present the only measure that holds any chance of permanent alleviation in established cases and is gradually replacing all such previous methods as cautery excision and collapse therapy. Its indications are, however, limited by the extent of the disease and ability of the patient to withstand a major operation. Limitation of surgery to those cases in which lipiodol bronchograms show dilatations confined to one lobe, usually lower, will yield the best results and lowest mortality. Such cases are now in the minority, but better and earlier diagnosis may reveal them more often. Removal of an entire lung or of both lower lobes is also possible but probably rarely justifiable in view of the risk. The presence of any marked general toxaemia increases this risk greatly. The single-stage operation is preferred by Romanis and Sellors and supported by the reported figures of Tudor Edwards and Thomas, and of Nelson and Roberts, whereas the results recorded by Sauerbruch and John Alexander offer some support for the delayed or two-stage operation. Another equally important factor is the patient's general condition. Here it is important to draw a sharp distinction between young patients who look fit and are able to be fairly active and profoundly toxic patients, with clubbed fingers, foetor, poor color and loss of weight and strength. Generally the toxic patients are faced with a more severe and difficult operation, with greater toughness and adherence of the lobe, while the other class comes to operation facing a risk definitely lower than for many major abdominal operations, for example gastrectomy. It is more than probable that all cases of bronchiectasis are slowly progressive; however, the almost inevitable disabling features may not develop for years and conservative treatment and observation seem justified until there is definite progress downward, when surgery should be considered, and under these conditions it carries an operative mortality of about 17 per cent. In the very toxic advanced cases but still fairly fit, lobectomy may produce excellent results but the mortality is now 35 to 40 per cent. A grave prognostic sign is the onset of a toxic cyanosis and when this occurs during the preliminary anaesthesia it is safest to abandon operative measures. The surgeon exercising fair judgment and undertaking a certain number of operations on patients in both groups will probably have a mortality of 15 to 20 per cent. Among the possible risks are, in addition to shock, emphysema, spreading pneumonia, bronchial fistula and atelectasis, massive necrosis and spreading gangrene of the chest wall and pleura, apparently associated with lack of resistance of the patient. Preoperative postural and suction drainage and bronchoscopy and carefully selected anaesthesia are of value in diminishing the risks. A shrewd idea of whether the operation is likely to prove difficult can be obtained by roentgenography following induction of artificial pneumothorax, which will usually demonstrate whether adhesions are present. With a history of empyema, there are nearly always difficult adhesions. Children stand the operation better than adults, in contrast to the case with abdominal operations. The dead space left in the chest fills in fairly rapidly in young children and the end results are usually better. Failure to cure some adult cases is due to the fact that unrecognized disease extending beyond the confines of the lobe exists. So few cases have been followed long that we are scarcely in a position to know the late results. Collapse therapy, as by phrenicotomy and thoracoplasty, may be temporarily palliative. Cautery pneumonectomy across the adherent pleural cavity establishes drainage but the treatment is prolonged and there is risk both of a permanent bronchial

fistula and injury to the pericardium, also of severe haemorrhage. Simple pneumonotomy has its place in severe cases unsuitable for lobectomy. Romanis and Sellors have operated on 10 cases for new growth of the mediastinum or chest-wall. No case with chest-wall involvement survived long. Nor have the results of lobectomy in chronic lung abscess been satisfactory. The chief points emphasized in the technique of lobectomy are the value of preliminary bronchoscopic suction drainage and proper securing of the hilum structures, with transfixion sutures, prior to removal of the lobe. A small intercostal drainage tube is inserted and suction applied after twenty-four to forty-eight hours. As soon as blood-stained serum ceases draining, unless it becomes turbid, the tube is removed.—*Lobectomy in Bronchiectasis, W. H. C. Romanis & T. H. Sellors, Lancet, December 19, 1936, ccxxxi, 1445.*—(*A. P.*)

Chronic Diffuse Bronchopneumonia.—Three cases are reported from the Brompton Hospital, London, England, characterized by a subacute to chronic course, the duration varying from three and one-half months to two years. Cough was an initial symptom in all cases, accompanied by sputum which became increasingly purulent, and by small haemoptyses. Dyspnoea was prominent and steadily progressive. Roentgenographically there was mottling suggestive of tuberculous infiltration. Pathologically the essential lesion is simple pneumonia in various stages of evolution in different foci. Ten comparable cases are recorded with necropsy findings. Bacteriological findings do not seem to be specific. Differential diagnosis must consider unresolved pneumonia, other forms of chronic pneumonia, and pulmonary tuberculosis. Progressive increase in symptoms and pathological findings with persistent failure to demonstrate tubercle bacilli speak strongly against tuberculosis. Even a predominantly lymphocytic effusion does not necessarily imply tuberculosis. Also, there is a poor response to bed-rest, in contradistinction to the response in tuberculosis.—*Chronic Diffuse Bronchopneumonia, J. G. Scadding, Brit. J. Tuberc., October, 1936, xxx, 186.*—(*A. P.*)

Chronic Pneumonia in Infants.—This condition may be due to primary tuberculosis or a chronic inflammatory process such as that caused by aspiration of oily substances. Vegetable oils excite little reaction. Codliver oil and liquid petrolatum are the most common offenders, but milk fat, egg yolks, olive oil, and amniotic fluid may also be causative factors. These pneumonic infiltrations persist for a considerable time and may be accompanied, or followed, by tracheobronchial lymph node enlargement. A consistently negative tuberculin reaction is most helpful in ruling out tuberculosis in those cases which do not come to autopsy. In 1932, six infants, one and one-half to three months of age, were admitted to the Massachusetts General Hospital because of fever, malnutrition, cough (in 5 cases), dyspnoea (in 4 cases), and either anorexia or vomiting. All received codliver oil from a teaspoon, and one recently had "nose drops" instilled 20 times. A roentgenogram on the one case seen within the first 24 hours of illness showed a marked diffuse, fine mottling throughout both lungs. On the eleventh day there was consolidation of the right upper lobe, except the very apex. The entire left perihilar region and the remaining portion of the right perihilar region showed a fairly well defined area of increased density surrounded by parenchyma which appeared normal. On the nineteenth day there was peripheral clearing of the shadow on the left, but the right lung was unchanged. Two other cases showed similar X-ray evidence on the sixteenth and fifth days, respectively. The other 3 cases showed coarse mottling chiefly in the upper lobes, and especially in the right, but there was no extensive homogeneous shadow as seen in the 3 cases mentioned above. One of the first 3 cases and two of the last group developed marked enlargement of the tracheobronchial lymph nodes. Some clinical symptoms persisted for two to six weeks. Serial roentgenograms showed a gradual decrease in the lung shadows beginning in the periphery, but the size of the lymph nodes was relatively unchanged ten months later. Tuberculin tests were consistently negative during this period. These cases are considered lipoid pneumonia in view of the history of exposure to oil inhalation, and their similarity to other reported cases of lipoid pneumonia which came to autopsy.—*Chronic Pneumonia in Young Infants, S. S. Sanderson, Am. J. Roentgenol., December, 1936, xxxvi, 757.*—(*E. M. J.*)

Chronic Pulmonary Infection and Friedländer's Bacillus.—Three cases of pneumonia due to *B. mucosus capsulatus* previously reported are reviewed with follow-up notes added. Another case is reported. In all cases *B. mucosus capsulatus* was the predominating organism in cultures made of the sputum. In the fourth case a culture of the patient's blood gave a growth of this organism on one occasion during the

acute phase. In three cases there was formation of multiple abscesses in that lobe or lung which had been the seat of the pneumonic process. In the remaining case there developed a large solitary abscess. One patient died two years after the pneumonia of an unrelated infection. One patient has been lost track of. A third patient is alive seven and one-half years after his pneumonia. The most recent patient is now doing manual labor two and one-half years after his pneumonia. He still has, however, both clinical and roentgenologic signs of pulmonary pathology. From a survey of recent literature on this subject and from a study of these cases it would appear that pneumonia caused by the Friedländer bacillus has certain rather definite characteristics. The leucocytosis is usually less than that of pneumococcic lobar pneumonia. The sputum in the acute stage is blood-tinged, mucoid, fairly abundant, and not particularly malodorous. From it Friedländer's bacillus is cultured as the predominating organism or in pure culture. Throat cultures do not yield this organism. Repeated examination will not disclose tubercle bacilli. Formation of temporary or permanent cavities is usual. The cavity walls are thin. The end result of pneumonia due to Friedländer's bacillus, with its cavitation, displacement of the trachea, elevation of the dome of the diaphragm and elevation of the hila of the lungs, simulates pulmonary tuberculosis. The time necessary for disappearance of the sputum, the low-grade fever, and the general symptoms may be months. In such cases a tuberculous process will be suspected. Cavities may or may not disappear completely. Until recently very few recoveries from this condition have been reported.—*Chronic Pulmonary Infection Due to the Friedländer Bacillus, L. H. Collins, Jr., Arch. Int. Med., August, 1936, lviii, 235.*—(*C. L. D.*)

Mycotic Infections.—A number of mycotic infections have been found that clinically and pathologically closely resemble tuberculosis and are diagnosed only by the identification of the organism. Early cases are difficult to diagnose, but since the only opportunity for cure is early in the course of the disease, before metastases or massive spread has occurred, more cases should be suspected and bacteriological studies made. While there is nothing pathognomonic of a mycotic infection the most frequently noted characteristics of the various mycotic infections are considered in detail in order that suggestive X-ray findings combined with a failure to find tubercle bacilli and suspicious peculiarities of history should lead to considering the possibility of such an infection and bacteriological examinations made. Coccidioidal granuloma, when a primary infection, is cutaneous, pulmonary or oropharyngeal. Lymph glands are selectively involved, abscesses are common and dissemination occurs through the bloodstream more often than by contiguity. It is manifested as cutaneous nodes, ulcers, sinuses, subcutaneous and deep abscesses, and lesions of the bones and joints. Pulmonary findings include caseous enlargement of tracheobronchial and mediastinal glands, consolidations, abscesses, pleural effusions, general associated lesions of chest structures. The most common roentgen findings include small and few cavities, even in advanced lesions, enlargement of the mediastinal glands, hilar thickening, miliary infiltrations which are more indefinite than in tuberculosis, osteomyelitis or abscess in the thoracic wall. Descending spread, older subapical lesions, linear fibroses, mediastinal or hilar retractions, parenchymal calcifications and acinous nodose manifestations are rarely found. Early diagnosis is seldom made. Blastomycosis usually occurs as a cutaneous granuloma spreading by contiguity in the skin. Systemic infections usually arise in the lung and roentgenographically look like tuberculosis. A "characteristic studding" following one or more main trunks, but not quite reaching the periphery from which they are separated by an area of diffuse density has been described. More fibrosis occurs than in coccoidal disease, but there should be a higher incidence of miliary lesions, adult adenopathy and associated bone pathology than in tuberculosis. Actinomycosis occurs as a primary pulmonary infection, but commonly involves the digestive tract. It has no great tendency to spread and usually does so by direct extension. It is characterized by a predilection to fibrosis and abscess. In the chest lesions have been classified by Naussae as bronchoactinomycotic or an actinomycotic bronchitis, pleuropulmonary marked by fibrosis, abscess and consolidation involving both lung and adjacent pleurae and pneumopulmonary distinguished by usually massive consolidations combined with abscess, miliary or nodular infiltration, and fibrosis. X-ray may show local or massive consolidation, pleural thickening which frequently is severe, encapsulated or generalized effusions, discrete nodular involvement simulating tuberculosis, or pneumonoconiosis, or an extensive fibrosis without consolidation. Frequently there is evidence of direct extension through the thoracic wall in either direction. Pulmonary lesions of strepto-

trichosis are usually primary. Roentgenological findings resemble actinomycosis more than tuberculosis. Fortulosis infections are frequently primary in the lung and are generally chronic. It is not unusual for the disease to terminate as meningitis. In the pulmonary form consolidations are usually nodular and occur often. There is a definite tendency to fibrosis, little pleural involvement, but a peribronchial thickening may occur. There is also a discrete nodular form which may be coarse or miliary. Cavities, apical and hilar retractions, and calcification would make a diagnosis of tuberculosis the more likely. Moniliasis usually involves the nasopharynx and in the lung is generally a secondary invader, resulting in bronchiectasis, pseudotubercles, fibrosis and granulation tissue, and peribronchial inflammation with marked fibrosis. Hilar thickening, peribronchial thickening, interstitial fibrosis, bronchiectasis, and diffuse or consolidated apical lesions are common roentgenographically. In conclusion the characteristics adding to the likelihood of a mycotic infection and the miscellaneous circumstances adding to such a diagnosis when suspicious X-ray findings are seen are summarized. It is pointed out that at present only by a detailed study of roentgenograms in known cases can any degree of accuracy in diagnosis be obtained, and if the examination does nothing more than promote definite bacteriological investigation it has served its purpose.—*Pulmonary Mycotic Infections, R. A. Carter, Radiol., May, 1936, xxvi, 551.*—(*G. F. M.*)

Pulmonary Moniliasis.—A fatal case of pulmonary moniliasis due to *Monilia albicans* is reported and a review of the literature on the same subject is included. The morphological, cultural, and serological characteristics and the pathogenicity of monilia for man and laboratory animals are discussed. The strain of *Monilia albicans* isolated from the sputum of this patient was subjected to different environments and the reactions on nutrient broths, each containing one per cent mannose, maltose, dextrin, lactose, dextrose, galactose, mannite, saccharose, levulose, dulcite, rhamnose, arabinose and xylose were determined. The findings prove definitely that the reaction of this strain of monilia was constant on all the sugars. This monilia was found to be pathogenic for rabbit, when injected subcutaneously, or intraperitoneally; for white mice when injected subcutaneously or intraperitoneally; but it was not pathogenic for guinea pigs when 1 cc. of sputum containing the microörganisms was injected intraperitoneally. A simple and useful preparation for the study of broth cultures of unstained monilia is described.—*Pulmonary Moniliasis, Report of a Fatal Case, A. H. Davis & E. L. Warren, J. Lab. & Clin. Med., April, 1937, xxii, 7, 687.*—(*F. G. P.*)

Distribution of Respiratory Gases in Closed Breathing Circuit.—It has been generally assumed that, in a closed breathing circuit of small volume such as is used in the determination of residual lung volumes, after a preliminary period of quiet breathing, the concentration of any inert gas becomes equal throughout the various parts of the system and thereafter remains equally distributed except for a constant slight excess concentration of inert gases in the lungs so long as the R. Q. is less than one. This assumption was tested by following the progressive changes in inspired and expired gases during the course of quiet breathing over a period of several minutes in a small closed breathing circuit such as used by Christie for the determination of functional residual air. The apparatus was so arranged that gas samples could be obtained from various parts of the circuit. The spirometer was filled with a measured volume of oxygen, the subject allowed to breathe through the circuit until redistribution of nitrogen between lungs and spirometer was completed, and then simultaneous samples of inspired and expired air were taken at successive intervals during this equilibrium period. It was found that the expired nitrogen concentration is lower than the inspired nitrogen concentration, and that associated with this decrease in expired nitrogen concentration there occurs a relative increase in expired oxygen concentration so that the R. Q. as measured is greater than one. This was shown to be due to the progressive increase in inspired nitrogen concentration with each breath, to mixing of inspired air in the lungs with air previously inhaled, and to the exhalation of mixed samples. Van Slyke and Binger, using a hydrogen-oxygen mixture in the spirometer, had found that at equilibrium after 5 minutes of quiet respiration, the N_2:H_2 ratio in the spirometer reached a level which thereafter remained essentially constant. It is suggested that this constant ratio should be interpreted as indicating only an equilibrium state with respect to these gases in the various parts of the system, and not an equality of concentration throughout all parts. In the determination of residual air volumes by quiet breathing, in a closed circuit apparatus, use of alveolar air samples, obtained before and at the end of the breathing period, enables a correction to be made for the inequality of concentration of inert gases throughout the system,

and this correction may amount to several hundred cubic centimetres in normal subjects. The manner of calculating this correction is illustrated.—*Distribution of Respiratory Gases in a Closed Breathing Circuit. I. In Normal Subjects, H. C. A. Lassen, A. Cournand & D. W. Richards, Jr., J. Clin. Invest., January, 1937, xvi, 1.*—(*A. E. M.*)

Distribution of Respiratory Gases in Closed Breathing Circuit in Pulmonary Fibrosis and Emphysema.—In a preceding paper it was shown that in a small closed breathing circuit of steadily diminishing volume (due to absorption of oxygen and carbon dioxide), the pulmonary air at any moment contains a lower nitrogen concentration than the spirometer. In normal subjects breathing quietly, tidal air was sufficiently well distributed through the pulmonary spaces, so that by sampling either expired air or deep alveolar air, the concentration of nitrogen in the pulmonary air could be measured fairly accurately and hence the functional residual air could be calculated. This method of study was extended to a group of cases of pulmonary fibrosis and emphysema. Theoretically, a large residual air will tend to increase the "nitrogen lag" in the lungs, and vice versa. In a group of patients with pulmonary fibrosis, the functional residual air was calculated in two ways; first, assuming equal mixture of inert gas throughout the system, and second, by the use of actual alveolar samples. It was seen that in patients with diminished residual air, the difference between the results by the two methods decreases with decreasing residual air. In a group of cases with extreme emphysema, the unequal distribution of respiratory gases through the lungs makes it difficult, if not impossible, to obtain reliable measurements of residual air with the methods in use. These subjects, having large residual lung volumes, would be expected to have large "nitrogen lags." Due, however, to poor distribution of tidal air through the lungs, this does not occur. Modified methods with the view of obtaining more reliable figures for the residual lung volumes in such cases are being experimented with.—*Distribution of Respiratory Gases in a Closed Breathing Circuit. II. Pulmonary Fibrosis and Emphysema, A. Cournand, H. C. A. Lassen, & D. W. Richards, Jr., J. Clin. Invest., January, 1937, xvi, 9.*—(*A. E. M.*)

Respiratory Response in Pulmonary Fibrosis and Emphysema.—Twenty normal subjects and 28 persons with fibrosis, emphysema, chronic bronchitis, bronchial asthma, and rheumatic heart disease were studied in order to measure the degree of dyspnoea by objective means and to elucidate the pathogenesis of shortness of breath. The ventilation and respiratory rates, tidal volume, oxygen consumption, and carbon dioxide production were determined during a standard form of exercise. These results were correlated with pulmonary capacity and its subdivisions, the ability to expand the chest, and the oxygen saturation of the arterial blood. It was found that these patients had a greater minute ventilation and a more rapid and shallow type of breathing at rest and during moderate exertion than do normal individuals performing the same amount of muscular work. There were striking similarities between the patients with fibrosis and heart disease in their ventilatory response to exercise. The degree of dyspnoea is proportional to the expression $\frac{\text{total ventilation}}{\text{vital capacity}}$. Dyspnoea is experienced when this value is greater than 51 and when this value is exceeded at low levels of work (300 kilogrammeters per minute for 5 minutes) it is an indication of pathological dyspnoea. As the value for this expression increases, the vital capacity and the oxygen saturation of the arterial blood decreases and the ability to expand the chest diminishes. The pulmonary reserve is a measure of the tendency to dyspnoea. Normal individuals can increase their resting minute volume nine-fold, while in patients who are disabled by pulmonary fibrosis and emphysema, the pulmonary reserve is so reduced that on moderate exertion the ventilation will constitute more than 60 per cent of the maximum minute ventilation. After exertion the oxygen content and the oxygen saturation of the arterial blood increases in the majority of patients with pulmonary fibrosis. In several patients with marked emphysema and fibrosis the oxygen content and saturation were found to be decreased immediately after exercise. The maximum minute ventilation that can be maintained for one and one half minutes is only roughly proportional to the vital capacity in normal individuals, while in cases of chronic pulmonary disease the relation is closer. The maximum minute ventilation of an individual may be predicted from the observed vital capacity by assuming that the tidal volume will equal 41.4 per cent of the vital capacity and that the rate of breathing will be 35.5 per minute. The ventilation per 100 cc. of oxygen absorbed increases from 2.40 litres for the normal subjects to 3.36 for the patients who complained of dyspnoea on slight exertion. It is not a very good index of the degree of dyspnoea since there

are marked irregularities in the individual values.—*Respiratory Response during Exercise in Pulmonary Fibrosis and Emphysema, N. L. Kaltreider & W. S. McCann, J. Clin. Invest., January, 1937, xvi, 23.—(A. E. M.)*

Total Capacity in Pulmonary Fibrosis.—In a previous study it was shown that in individuals with pulmonary fibrosis there was a reduction in the total and vital capacities and an increase in the residual volume, and, as the degree of fibrosis increased, these alterations were accentuated. The estimation of the vital capacity and the ratio $\frac{\text{residual air}}{\text{total capacity}} \times 100$ are important indices of respiratory efficiency. To the 58 cases previously reported are added 21 cases of minimal fibrosis, 3 minimal fibrosis with emphysema, 3 typical nodular silicosis, 4 nodular silicosis with beginning agglomeration, and 1 case of silicosis with dense apical shadows and basilar emphysema. Eighteen cases with pulmonary fibrosis were reëxamined after an interval of from 1 to 3 years. There were no significant deviations between the predicted and observed values for the total pulmonary capacity and its subdivisions in cases of minimal fibrosis. They were essentially the same as in normal individuals of the same age. As the degree of fibrosis increased, total and vital capacities were reduced, while the residual air and mid-capacity increased. In pulmonary fibrosis complicated by obstructive emphysema, the observed total capacity approaches the predicted one, vital capacity is greatly reduced, and the residual air increased. Reduction in vital capacity and an increase in the ratio given above are proportional to the degree of dyspnoea. There is a reduction in the ability to expand the chest in pulmonary fibrosis. Over a 3-year period no change could be noted clinically or by tests in cases of uncomplicated nodular silicosis. Patients with minimal fibrosis are not disabled while those with nodular silicosis are partially so. When the condition is complicated by infection or cardiac failure, the pulmonary reserve is greatly reduced and total disability is the rule.—*Further Studies of the Total Pulmonary Capacity and Its Subdivisions in Cases of Pulmonary Fibrosis, N. L. Kaltreider, W. W. Fray, & H. van Z. Hyde, J. Indust. Hyg. & Toxicol., April, 1937, xix, 163.—(L. F. B.)*

Bacteraemia in Pneumococcic Pneumonia.—This is a report of an analysis of 1,586 cases of pneumonia associated with specific pneumococci of types I to XXXII (Cooper) in which cultures of the blood were taken during the acute disease and/or at autopsy. All cases were in individuals twelve years of age or older. Patients having postpneumonic complications such as empyema and pulmonary abscess at the time of admission to the hospital were excluded. Cultures were made from the sputum, blood or pleural fluid during the course of the illness and of the blood at necropsy if no type specific pneumococci had been recovered during the patient's life. Every one of the thirty-two types was represented although there were too few of a number of these to be significant. For each type the death rate in cases in which blood cultures were positive was two or more times as high as in those from which no cultures were obtained. In those types met with sufficiently frequently the relation of bacteraemia to mortality varied considerably. Positive blood cultures were obtained in slightly over one third of all cases. The incidence of bacteraemia varied greatly with the different types. It was highest in cases with type-II infection. In the fatal cases bacteraemia was four times as frequent as in the nonfatal cases. It would be even higher if one were to exclude those cases which were given specific serum therapy. The mortality rate increased progressively with the age of the patient. This was true for cases both with and without bacteraemia. The incidence of bacteraemia paralleled the mortality through the fifth decade. Beyond that the mortality rate continued to increase steadily while the incidence of bacteraemia declined. As expected, the mortality rate for bronchopneumonia (atypical pneumonia) was higher than that for lobar pneumonia, but bacteraemia was less frequent for most types of bronchopneumonia. This indicates that atypical pneumonia was frequently a complication or terminal event. The death rate was higher with more extensive involvement. Bacteraemia was considerably more frequent when two or more lobes were involved. It was also more frequent when three lobes were involved than when only two were. For any given involvement the incidence of bacteraemia was higher in the older age groups. This was especially apparent when only a single lobe was affected. In the older age groups, two or three lobes were more frequently involved. There was little difference in the incidence of bacteraemia and in the mortality among those patients who were admittedly habitual drinkers, even when they were admitted to the hospital acutely intoxicated or in delirium tremens. The younger alcoholics, however, showed a higher incidence of bacteraemia and a higher mortality, but the number of such

cases was small. There was a greater incidence of bacteraemia in cases where pneumonia occurred during the course of other serious conditions or diseases. The same was true of the mortality. This was especially striking in the cases in which the blood cultures were not positive. Bacteraemia was most frequent in the presence of a white blood count of less than 10,000. The incidence of bacteraemia was higher among those cases with white blood counts over 35,000 than among those whose counts ranged between 10,000 and 34,000. Bacteraemia was twice as frequent in cases which developed postpneumonic complications. The death rate was higher in cases with postpneumonic complications. If the pleural effusion proved to be sterile the incidence of bacteraemia and the mortality figures were similar to those in cases which did not develop complications. Untreated cases terminated as a rule on the seventh to the ninth day of the disease by lysis or by death, regardless of the presence or abscence of bacteraemia. Recovery took place in the cases treated with specific serum usually on the fourth to the sixth day regardless of the presence or absence of bacteraemia. Fatalities in cases treated with serum in the presence of bacteraemia occurred with equal frequency on the fourth to the sixth day and on the seventh to the ninth day, but if there was no bacteraemia, fatalities occurred mostly on the seventh to the ninth day. The mortality rate was higher among cases with positive blood cultures irrespective of the day of the disease on which the cultures were taken. In untreated cases the incidence of bacteraemia increased moderately as the disease advanced. The death rate in cases with positive blood cultures following sterile ones was the same as in all cases with bacteraemia. The incidence of positive cultures from heart's blood taken at necropsy two to eighteen hours postmortem was similar in all fatal cases. Positive cultures were obtained postmortem in one-third of the cases with sterile cultures during life. In mixed pneumonic infections type I was cultured from the blood-stream in all nine cases in which it was present. Type III was cultured from the blood-stream in only six of the nine cases in which it was present. Type X was cultured in three cases and type XX in two. In cases with bacteraemia recovery rarely took place if the colony count rose above ten per cubic centimetre of blood. The prognosis was usually unfavorable if the colony count increased in successive cultures. The heaviest count was obtained from a fatal case. It was 35,000 of type-II pneumococci. The largest colony count from a case in which recovery took place without the use of specific serum was 1,700 of type-V pneumococci.—*Clinical Significance of Bacteraemia in Pneumococcic Pneumonia, R. C. Tilghman & M. Finland, Arch. Int. Med., April, 1937, lix, 602.*—(*C. L. D.*)

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